12-2011

Describing Home Play Food Availability Among Preschoolers Within a Nutritional Context: Relationships with Gender, Food Preferences, Food Neophobia, and Maternal Feeding Styles

Jenna Marie Waters
University of Tennessee, jwasiele@utk.edu

To the Graduate Council:

I am submitting herewith a thesis written by Jenna Marie Waters entitled "Describing Home Play Food Availability Among Preschoolers Within a Nutritional Context: Relationships with Gender, Food Preferences, Food Neophobia, and Maternal Feeding Styles." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Nutrition.

Melissa B. Hansen-Petrik, Major Professor

We have read this thesis and recommend its acceptance:

Katherine Kavanagh, Dawn P. Coe

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

Describing Home Play Food Availability Among Preschoolers Within a Nutritional Context: Relationships with Gender, Food Preferences, Food Neophobia, and Maternal Feeding Styles

A Thesis
Presented for
the Masters of Science Degree
The University of Tennessee, Knoxville

Jenna Marie Waters
December 2011

Acknowledgements

I would like to thank my major professor, Dr. Melissa Hansen-Petrik, PhD, RD, LDN, for her time, commitment, and patience throughout the completion of this thesis. Her guidance and expertise were invaluable. I would also like to thank my additional committee members, Dr. Katherine Kavanagh, PhD, RD, LDN and Dr. Dawn Podulka Coe, PhD for their thoughtful input and recommendations devoted to this research. Last, but certainly not least, I would like to thank my wonderful husband, Brandon, for his love, support and encouragement through this journey.

Abstract

The purpose of this study was to describe home play food within a nutritional context, specifically related to gender, food neophobia, maternal feeding styles, and food preference among pre-school aged children. Additionally, our aim was to gain a better understanding of how play foods may serve as a proxy for exposure and how this might affect food familiarity and preference in this population. Mothers of children ages 2 to 5 years (n=181) were recruited from a children's consignment event in Knoxville, Tennessee, to complete a survey to assess home play food availability, children's dietary preferences, maternal feeding style, and food neophobia. Overall, 80.7% of children had play food at home, with an average of 32 different play foods represented per household among those with play foods. Vegetable play foods were most commonly reported by mothers followed in descending order by fruit, grains, sweets/fats, and protein MyPlate food groups. Girls had significantly more play food items at home than boys, specifically within the fruit, vegetable, grain, protein, and sweets/fats categories but not within the dairy, mixed dish, beverage, or condiment categories. No significant relationships were observed between home play food availability and number of foods "liked" within food groups and play food availability did not modulate the inverse relationship between food neophobia and number of foods liked. Compared to mothers with an authoritarian feeding style, mothers who exhibited the indulgent feeding style had children who were significantly less neophobic, and had a lower reported preference for foods classified as sweets/fats. Additionally, uninvolved mothers had children with a significantly lower preference for vegetables compared to indulgent mothers. Further research is necessary to more clearly identify the existence of a relationship between play food exposure and food preferences in preschool-aged children.

Preface

This thesis is divided into two sections. Section I includes an introduction, a review of the literature, and the study's research questions. Section II includes a manuscript for publication containing the introduction, methods, results and discussion related to the research.

Table of Contents

List of Tables

List of Figures

INTRODUCTION

The prevalence of childhood obesity in the United States has led to investigations to identify possible interventions to improve dietary intake among children. Food preferences, which are strongly associated with food familiarity, are one of the most significant determinants of children's food intake. Repeated exposure to foods via taste and visual sensory mechanisms has been positively associated with children's food preferences and willingness to try new foods. One mechanism of "visual exposure" that has not been explored in depth is play food. Thus, this research sought to begin describing how play foods may serve as a mechanism of exposure to affect food familiarity and preference.

SECTION I

OVERVIEW

Abstract

Childhood overweight and obesity continue to be nationwide problems among preschool children, as evidenced by the tripling of childhood obesity between 1980-2008 (1). Research indicates that eating habits formed during childhood persist throughout adolescence and into adulthood (2), thus emphasizing the importance of promoting development of healthy eating habits in early childhood. Food preference is one of the most significant determinants of children's food intake (3, 4), and is strongly associated with food familiarity (5, 6). While research has suggested that food exposure can positively influence children's food preferences, intake, and food neophobia (7), little research has explored whether play foods may be effective as a means of proxy for food exposure and potentially linked to increased food familiarity and preference. Thus, the purpose of this research is to explore the relationship between play food access and a multitude of nutrition parameters within preschool children including food neophobia, maternal feeding styles, and food preferences. The findings of this research may suggest potential mechanisms to test in future interventions designed to increase consumption and preference for healthy foods among preschoolers.

Review of Literature

Overweight and Obesity in Preschool Children

Overweight and obesity continue to be nationwide problems affecting not only adults, but also children and adolescents, including children of preschool age (8). Current data indicate that 21.2% of U.S. children ages 2-5 are classified as overweight or obese. Specifically, 21.2% are >85th percentile BMI for age and gender, and 10.4% are $\geq$ 95th percentile BMI for age and gender (9). This is of importance due to the short and long term health effects of overweight and obesity. Immediate health risks include psychosocial effects, abnormal glucose tolerance, and cardiovascular risk factors including hypertension and high cholesterol (10). Long-term chronic diseases related to overweight and obesity include coronary heart disease, type 2 diabetes, stroke, some cancers, and osteoporosis, among others. Body weight has been directly linked to adult mortality and morbidity (11).

Trends in rising body weight have been attributed to alternations in dietary intake and physical activity patterns in recent decades. Young children have been identified as a primary target for prevention through modification of dietary and physical activity patterns, the former being the focus of this review. This is most appropriate as research suggests that eating habits developed during early childhood tend to be sustained throughout adolescence and into adulthood (2, 12). In one study, researchers tracked eating patterns of Chinese children over a period of 6 years (2). The longitudinal study, which observed 984 children initially aged six through thirteen, showed consistency of dietary patterns into adolescence, with 33.2-50.4% of children maintaining the same dietary pattern 6 years after the baseline measurement (2). Other research has suggested that these consistencies in habits and behaviors are established as young

as three to four years of age (12). If life-long eating patterns are so heavily influenced by behaviors established during the early years of life, then early childhood dietary patterns are a critical intervention target for curbing current trends in prevalence of overweight and obesity. Understanding current dietary patterns of children, as well as specific factors that influence establishment of dietary behaviors during childhood, is necessary in order to move forward with effective intervention strategies.

Trends in Children's Eating Habits

Obesity trends coincide with the evolution of children's dietary intake patterns. Compared to three decades ago, the profile of dietary intake of children has shifted towards more energy-dense, less nutrient-dense foods in greater quantities (13). Children are consuming a significantly higher proportion of calories from snack foods including candy, desserts, salty snacks, and sweetened beverages, and proportionally fewer calories from fruits and vegetables (13, 14). A study by Cockroft assessed fruit and vegetable intake of preschool aged children over a 24 hour period via an adult-completed food diary. Of the 207 children in the study, only 20% met the recommendation for 5 fruits and vegetables daily, while 11% ate no fruits or vegetables on the observation day (14). In addition, vegetable intakes were considerably lower than fruit intakes, with 39% of the sample consuming no vegetables at all (14). Other research focusing on evolving dietary intake patterns shows that 99% of U.S. children ages two through six snack regularly and that this age group has the largest proportion of energy intake from snacks compared to other childhood age categories (13). Desserts and sweetened beverages contributed the most energy from snack foods among children. Furthermore, the increase in energy intake from snacks coincided with an increase in overall average energy intake among

this age group between 1977 and 2006. Considering the low nutrient density of such foods, children, like adults, generally seem to be consuming more calories but less nutrients (13), a combination that is not conducive to long-term healthy weight and overall health. Given current dietary intake patterns among young children, it is clear that identifying factors that contribute to development of these dietary patterns is a crucial step toward identifying potential intervention targets. Several factors that are related to children's eating habits have been identified, including socioeconomic status, influence of parents, advertising and media, home and preschool environment, and a preference for and familiarity with foods. Because children tend to eat what they like (3), focusing on factors that influence the environmental aspect of 'preference' by changing what children desire to eat could be an extremely effective avenue towards improving children's dietary patterns. It has been suggested that children's food preferences are strongly influenced by their experiences with foods (15), through a multitude of sensory mechanisms. While some research has identified components that may affect food preference in preschool children (3, 5, 16-23), little research has explored the role play food may play in increasing food familiarity and, consequently, food preference and intake. Understanding whether and how play food affects the food preferences and dietary intakes of young children may offer direction for future interventions and policy development to promote lifelong health from an early age. The first step in developing this understanding is to review existing research on factors that influence food preferences and dietary intake among preschool aged children so that the role of play food, if any, can be placed in the appropriate context.

Factors Influencing Children's Eating Habits

Socioeconomic Status

Demographic factors including socio-economic status and parental education level may potentially influence eating patterns among children. The prevalence of obesity (classified according to BMI for age and gender) among low-income U.S. children, ages two through four years, increased from 12.4% to 14.5% between 1998-2005, and was 14.6% as of 2008 (24), which is higher than the estimated obesity prevalence of 10.4% among children ages two to five years of age (2). Several studies have investigated dietary patterns of young children in low-socioeconomic households. Watt et al.(25) examined five key dietary parameters (iron, zinc, vitamin C, vitamin A, and calories) for children ages one-and-a-half through four-and-a-half and related dietary adequacy to a variety of socioeconomic variables. Results showed that significantly more children who met none or one of the recommended nutrient intakes lived in households which: were renting their domicile, were receiving income support, had an annual household income of less than $25,000, had no car, had mothers with lower levels of education, were located in impoverished parts of England, and the head of the household was unemployed or their current or most recent occupation was manual labor. Furthermore, the last three variables accounted for 60% of the variance, implying that maternal education, living in an impoverished area, and primary guardian employment status were the most influential of the aforementioned factors. Although only 1% of preschool children met all five dietary recommendations despite socioeconomic factors, children from households with lower social, economic, and demographic status were much more likely to fall into nutritionally-inadequate groups (25). Similarly, Cockroft et al. observed that children from households in which parents had attained an A-level education (comparable to that of an advanced high school diploma in the

U.S.) consumed significantly more fruits and vegetables than children from households of parents with lower educational attainment (14). Both of these studies further concluded that maternal education level may be the most significant factor influencing the inclusion of essential nutrients in a young child's diet (14, 25). The interaction between sociodemographic variables and children's eating patterns is influenced by the consequential effects these variables have on the home environment (26, 27).

Home Environment

A young child's dependence on their parents for food allows the home food environment to be strongly related to children's food consumption. Studies have shown that there are relationships between a child's food intake and food availability (26) and accessibility (27) in the home. Research has indicated that children are more likely to eat fruits and vegetables when they are both available and accessible (26, 27). A study by Baranowski (27) observed the social-environmental influences on African-, Euro-, and Mexican-American children's diets. It is suggested that more accessible fruits and vegetables (including cut-up, ready to eat, easy to reach, and easy to eat) likely created less competition with high energy dense, ready-to-eat foods, thereby increasing consumption (27). It is therefore important to examine the foods that are available in the home as a starting point.

Byrd-Bredbenner et al. examined the sources of calories and key nutrients of the food supply available in the homes of young children (28). Results indicated that essential nutrients including vitamin A, vitamin C, protein, dietary fiber, iron and calcium were present below optimal amounts, while nutrients that are recommended to be minimized including total fat,

cholesterol, sodium and sugar were present above recommended amounts. This study concluded that the discrepancy between food consumption and nutritional recommendations can be traced back to the fact that the household food supply itself doesn't reflect nutritional recommendations. Regardless of other influences on children's food preferences, the home food supply itself must provide the means for young children to eat healthfully if healthful eating is to take place (28).

Influencing young children's food preferences, healthful or otherwise, may actually impact the home food supply, which has been shown to being influenced by the preferences and requests of individuals residing there, including children (28). A qualitative study by Maubach et al. (29) found that while many parents acknowledged the ideal of buying nutritious foods for their children, their children's taste preferences and food requests affected their buying choices, and undermined their ideal of healthfulness. It is thought that children's food requests are largely influenced by advertisements (30), and preschool-aged children not only seem to pay more attention to advertisements than older children (31), but also make more food-related requests than older elementary school children (32). The most common foods requested by children are those most frequently advertised, including candies, chocolate, ice-cream, biscuits, cakes, fruit juice, and soft drinks (30). While some research suggests that children make requests based on media influence, other research adds that children's food selections may mirror what their parents typically purchase (33). Regardless of the source, children request what is appealing to them based on their preferences, thereby suggesting that food supply in the home, and consequently dietary intake patterns, can potentially be modified by altering children's food preferences.

Food Preference

Food preference is consistently reported as one of the most significant determinants of children's food intake (3, 4, 34). In general, children eat what they like, especially in societies where food supply is ample (3). Lowe et al. found that intakes of fruits and vegetables increased as liking for these increased (34). Therefore, if food preferences don't align with dietary recommendations, children are unlikely to consume adequate nutrients. Russell et al. (3) conducted an Australian-based study evaluating dietary preferences of preschool-aged children and how these aligned with national dietary recommendations. The most preferred foods were cereals and 'extra foods' including cakes, chocolate, pies, and potato crisps, while vegetables were generally the least liked. On average, only 7% of vegetables were liked compared to 64% and 56% of cereals and 'extra foods' liked, respectively. An American study with the same objective found that more than 75% of breads, pastas, and desserts were liked by children, while less than 50% of the listed vegetables and meat alternatives were liked (35). Of the top twenty-four disliked foods, seventeen were vegetables. Both of these studies concluded that these discrepancies between food preferences and recommendations for healthy dietary intake patterns may be hindering the actual consumption of a healthy diet (3, 35).

It has been suggested that children's food preferences are primarily learned through experiences with foods (15), and are influenced in a multitude of ways. These factors include parental feeding behaviors, peer influence, media and advertising, and food exposure, each of which will be explored in the next section.

Factors Influencing Children's Food Preferences

Parental Influence on Food Intake and Preference

A wide range of familial factors, both hereditary and environmental in nature, seem to influence children's food preferences (24, 36-39). Several bodies of research have suggested the existence of a genetic component of food preferences in young children (40, 41). In a study exploring food preferences of 214 mothers and their three- to four-year-old twin children, Breen et al. found that heritability of food preferences was significant with desserts, fruits and vegetables, and protein (40). In contrast, a meta-analysis exploring the similarities in food preferences between children and their parents concluded that parental food preferences are of small importance in predicting children's food preferences (41). While the magnitude of the role of heredity in development of children's food preferences is not clear, a number of environmental factors seem to also be involved.

The way in which parents behave while feeding their children seems to have a significant impact on children's dietary intake, preferences, and weight status (36, 42-44). Baumrind (36) has identified and categorized general parenting styles as 'authoritarian', 'authoritative', 'indulgent' and 'uninvolved', based on the level of two underlying dimensions; demandingness and responsiveness. Demandingness refers to extent to which parents exhibit control, maturity demands, and supervision in their parenting, and responsiveness refers to the extent to which parents show warmth, acceptance and involvement towards the child (39). These parenting styles have also been used to describe parents' feeding styles (36). 'Authoritarian' is characterized by high demandingness and low responsiveness, and refers to a controlling feeding style in which the parent restricts or forces the child to eat certain foods. 'Uninvolved' feeding

behavior is characterized by low demandingness and low responsiveness. 'Authoritative' behavior is a balance of these two, characterized by high demandingness and high responsiveness, in which parents express warmth and guidance, recognize their child's hunger and satiety cues, and respond accordingly to such messages. Lastly, 'indulgent' feeding behavior is distinguished by low demandingness and high responsiveness (36, 39).

Research indicates that a strong association exists between these feeding styles and children's dietary intake as well as children's food preferences (36, 39, 42, 44, 45). Authoritarian feeding styles including specific strategies of restriction, rewarding, and pressure are associated with a greater intake of unhealthy foods (43), lower intake of fruits and vegetables, and child weight gain (42). This parenting style has also been positively associated with higher BMI and total fat mass in children (44). Furthermore, children who were forcefully encouraged to consume vegetables had a lower preference for such foods (16), and restriction of certain "bad" foods promoted consumption of these foods during times of no restriction (45, 46).

In contrast, researchers have identified authoritative feeding styles as having a positive impact on children's dietary intake. Specific authoritative feeding strategies of monitoring, child control, and parental modeling are associated with lower intake of unhealthy foods, and a higher intake of healthy foods (43), specifically fruits and vegetables (42, 43, 47). One study by O'Connor et al. (37) explored how parental feeding practices were associated specifically with preschool children's fruit and vegetable intake. They concluded that a combination of practices, including increased availability of fruits and vegetables, and non-directive control (similar to authoritative feeding style) by use of teachable moments with low disciplinary measures may provide an environment that best promotes fruit and vegetable consumption in young children (37, 48). Altogether, the findings suggest that foods offered in a positive context will result in a

greater intake, whereas foods offered in a negative context will be consumed less (38). Overall, the environment offered to children by their parents is pivotal to the development of healthy foods preferences early in life.

Peer Influence on Food Preference

Similar to the influence of environment fostered by parents, dietary intake and eating patterns of preschool children who spend a large portion of their day in school are inevitably influenced by the preschool environment. A study of pre-school children by Russell et al. (3) found that attending child care is associated with a greater likelihood of children liking 'extra foods' (cakes, chocolate, pies, and potato crisps), a greater variety of foods, and more foods in total. Thus, the child-care environment may influence a child's food preferences both positively and negatively through peer modeling and exposure (3), two of the three factors that reliably influence children's eating behaviors (34).

Mirroring the effects of parental modeling, peer modeling has been shown to powerfully influence preschoolers' food preferences. In fact, 'modeling' in general has been shown to be particularly effective when exhibited by children of the same age or slightly older (49). A study conducted by Birch et al. observed peer influence in preschool children and found that preference for and intake of disliked fruits and vegetables increased when other children chose to eat such foods in their presence (5). In a similar study by Duncker et al. (17), preschool children were questioned on their food preferences and then paired with other children with differing food preferences. Immediately after exposure to their peers with differing preferences, children expressed a high percentage of liking for their initial 'un-preferred' foods. This phenomenon can

have both positive and negative effects, depending on the direction of peer influence. For example, enhancing preschoolers' preferences for fruits and vegetables could have a domino-like effect by influencing other children to eat fruits and vegetables as well.

Food Neophobia

Food neophobia is described as the reluctance to eat, or the avoidance of new foods (38). Some bodies of research suggest that food neophobia is arguably the strongest psychological barrier to increasing a child's dietary variety (6, 50). Russell and Birch (51) have suggested that food neophobia in preschool children is strongly associated with their everyday food preferences. Food groups most impacted by food neophobia include fruits, vegetables and meats (52, 53). In other words, food neophobia is negatively associated with fruit and vegetable consumption(54). Furthermore, children with food neophobia involving fruits and vegetables tend to compensate through consuming higher amounts of fat (55). Equally concerning, children with higher food neophobia tend to have greater dietary preferences for fat, energy, and sugar than those with lower food neophobia (51).

While some researchers attribute food neophobia to inborn personality traits and temperament (56), other researchers argue that it is dependent on age, environmental and social influences, thus allowing it to be potentially altered with proper instruction as a child develops (57). Rozin et al. (58, 59) suggested that food neophobia is derived from an inborn survival mechanism to help children avoid eating toxic objects in their environment, by intuitively rejecting foods with which they have no prior experience. Thus, rejection would occur at the point of visual contact, rather than after ingestion, which would theoretically risk poisoning.

Therefore, if food is visually unfamiliar, children are likely to reject it (18). This is one potential explanation why food neophobia seems to rapidly increase between the ages of two and four years (19), and peak between the ages of two and six years of age (20). These are the years in which mobility and self-exploration develop. A study involving a social media campaign observed that children use a number of exploratory sensory behaviors including feeling, smelling, and playing with new foods before they actually ingest them (60). This process aligns with Rozin's (58, 59) concept of "learned safety" which allows children to make determinations if the food is safe to consume. Furthermore, Birch et al. (21) suggests that children will associate their "food experiences" with foods that are visually similar, and are more likely to consume a new food if they have already accepted one that appears similar. Therefore, food neophobia could be affected, either positively or negatively, by the visual similarities of a foreign food to one they have experienced in the past. Thus, sensory stimulation, especially visual encounters, could potentially have an impact on food neophobia.

Despite the specific theories regarding the origins of food neophobia, there seems to be a consistent link between food neophobia and familiarity with food items (21). Because food neophobia is inversely related to exposure of food variety in childhood (19), it is presumably decreased when food exposure to novel foods increase (61). Several bodies of research have explored the effects of food exposure on food neophobia, as well as food preferences and intake in children (15, 44, 58, 60).

Food Exposure

Recent research suggests that repeated food exposure is related to a child's food preference, intake, and food neophobia. Lowe et al. (34) suggested that food exposure is one of the top three factors that reliably influences children's eating behaviors. The proposed mechanism by which this occurs is that food exposure increases familiarity, which may potentially have an impact on preference (38). As one researcher put it, "children like what they know and they eat what they like" (22). When Birch et al. (5) studied the food preferences of children, two dimensions accounting for 60-80% of variance emerged; sweetness and familiarity. Furthermore, familiarity has been noted as being *the* most influential factor of food preference for children under four years of age (5). Therefore, increasing familiarity of certain foods in young children could potentiate a higher intake of those particular foods.

Food exposure involves interacting with foods in one of several ways, which can include but is not limited to repeated tasting, as well as playing with and manipulating real food. Repeated exposure has consistently been shown to result in an increase of food preference in children (23, 62). In a group of preschool children ages three through four, 8-15 tasting exposures were necessary for food preference to increase (62). An experimental intervention study by Wardle et al. (63) observed the impact of repeated taste exposures of certain vegetables on food ranking over a two week period. Children who tasted a vegetable every day for 14 consecutive days rated their liking of the vegetable significantly higher after the intervention than at baseline. These results suggest a positive relationship between food exposure and food preference. However, Birch et al. (61) suggested that "visual" exposures have a different effect on outcomes than do "taste" exposures. Specifically, Birch suggested that mode of experience with the food determines mode of outcome. Thus, visual exposure would be necessary to

increase visual preference for a food while taste exposure would be necessary to potentially increase taste preference for a food. While visual experience was not sufficient in significantly increasing taste preferences, recent studies have suggested that enhanced visual preference may increase the likelihood of taste exposure to occur (64). Thus, visual exposure to foods may have an indirect influence on degree of food neophobia.

School garden nutrition education programs have recently been used as a mechanism of exposure. Studies that have addressed the outcomes of these programs describe how the food interaction (including tasting, handling, etc.) affects one of several factors related to fruit and vegetable intake and preference. A wide range of garden-based nutrition education programs involving elementary school aged children have demonstrated an increased fruit and vegetable intake (65), willingness to taste (64), and preference (7, 64). While there is only one small study exploring the effects of gardens on food preferences in preschool children (66) the outcomes for older age groups suggest that food exposure in the form of taste-testing, preparing food with fruit and vegetable ingredients, working in the garden, and learning about fruits and vegetables has the potential to positively influence fruit and vegetable intake, willingness to taste, and preference in older age categories (7, 64, 65, 67). Parmer et al. (68) observed a significant increase in fruit and vegetable identification, preference, and consumption in second grade students who participated in nutrition education and a hands-on gardening experience that was independent of tasting. These data suggest that positive changes in fruit and vegetable preferences and intake may not necessarily be dependent only on tasting foods, but rather could be related to food handling and familiarity itself. Currently, the youngest group of children observed with garden-enhanced nutrition education was preschool children, who showed a significant increase in preference, or willingness to try three out of the four food items tested

(66). Similarly, a study with first grade students showed a positive association between gardening and willingness to taste those vegetables (64). In addition, several studies have shown a significant increase in children asking for fruits and vegetables (64, 69). This is of interest due to the relationship between asking behaviors and home food supply discussed previously. These studies suggest that food exposure through various modes can increase willingness to try fruits and vegetables, thereby diminishing food neophobia and potentially increasing overall consumption of nutritious foods (52, 53). Additional modes of influence that contribute to such variables are food messages delivered through advertising and media to young audiences.

Social Marketing and Media Influences

In addition to the unquestionable influence of food exposure involving real, edible food on children's food familiarity and preferences, studies have shown that these variables can also be influenced, both positively and negatively, by intangible food messages via social media and advertising. The marketing and advertising of food products may have an impact on children's food familiarity and preferences, and thereby, food intake (70). Young children are exposed to food advertising and marketing through various vehicles including television, internet, radio, and books. The Hastings Report released by the Food Standards Agency in the UK found that food advertising to children affects children's preferences, purchase behaviors, and consumption for not only different brands but also for food and beverage categories (70). Because a large proportion of marketing is for energy dense, low nutrient dense foods and beverages, children are more likely to prefer such foods that may ultimately compromise their health (71, 72). Lobstein et al. (73) observed a significant positive association between the proportion of children who were overweight and the number of viewed advertisements per hour on children's television.

This relationship was seen with greater significance in advertisements for energy-dense, micronutrient-poor foods. Although to a lesser extent, a negative relationship was observed with healthy food advertisements, which are far less advertised (73).

Understanding that food advertising can affect children's eating behaviors, food marketing guidelines have been proposed by several groups. The Center for Science in the Public Interest (CSPI), a non-profit agency that works to promote healthy eating and physical activity, has set guidelines for responsible food marketing to children. This set of guidelines suggests that food and beverages that meet criteria of 'low nutrition quality' should not be marketed to children (74). In addition, a report released by the World Health Organization (WHO) outlines similar regulations imposed by other countries including Norway, Brazil, Spain, Quebec, South Africa, and New Zealand. Regulations range from proper labeling of marketed items to complete prohibition of commercial advertising directed towards children under 13 years old during child programming (70). More recently, the Interagency Working Group on Food Marketed to Children, which is a combined effort of the Federal Trade Commission, Food and Drug Administration, Centers for Disease Control, and the U.S. Department of Agriculture, has proposed voluntary principles detailing nutritional quality of foods marketed to children ages two through seventeen (75). It is suggested that by regulating food marketing strategies directed towards children, food preferences and overall dietary intake can and will improve.

While media and advertising are generally recognized as having a negative impact on children's food preferences and requests, several studies have examined ways in which social marketing may have the power to positively influence children's food preferences and, thereby, help overcome children's ambivalence towards or negative perceptions of healthier foods (42, 43, 60, 76). Some researchers have suggested that social marketing and advertising have the

potential to positively influence children's food preferences, neophobia, and intake (60, 77). Horne et al. (77) observed the effect of visual media on fruit and vegetable consumption in children ages five through seven. Over the course of 16 days, one group of school children viewed six episodes of an interactive short-film, titled "Food Dudes", who fought against the evil "Junk Punks" to prevent them from depriving the world of fruits and vegetables. The episodes contained songs, celebrity endorsements, and sound bites as well as materials for the children including themed "Food Dude" pens, pencils, school supplies, and certificates. The control group had no intervention. Both schools measured baseline, intervention, and follow-up intakes of fruits and vegetables at school. Results of this study indicated that children from the experimental school consumed significantly more fruits and vegetables during intervention compared to baseline, as compared to children at the control school who had no change whatsoever in consumption. Furthermore, a four-month follow-up measurement indicated that fruit and vegetable consumption was still significantly higher than baseline compared to the control school. A similar experimental study by Johnson et al. (60) implemented a 12-week program directed towards preschool aged children involving "The Food Friends" social marketing campaign. The campaign consisted of nutrition activities, food-related story-books, repeated opportunities to try new foods, and parent newsletters all with the seven "Food Friends" characters theme. The control groups were not exposed to the social marketing campaign, but continued with nutrition education requirements. Results indicated that, compared to the control group, the experimental group rated more foods as "liked", children's liking for both familiar and novel vegetables increased significantly, and the rate of refusal to try new foods diminished after the 12-week program. Overall, they concluded that the social marketing campaign was successful in increasing the children's willingness to try and recognize both familiar and new

foods. These studies not only suggests that visual media can be used to positively influence children's diets, but also food-related messages can have both short-term and long-term effects on food consumption (77).

These data suggest that food exposure to varying degrees has the ability to influence a number of variables in children that seem to lead to an increased overall consumption of nutritious foods. Considering that social media and advertising stimulates only the visual and audible senses, it would seem that it would be a far less powerful force of exposure compared to interactions that stimulated all sensory abilities. However, despite the varying levels of sensory stimulation, exposure to real foods and exposure to foods via media and advertising seem to have very similar effects on willingness to try new foods, as well as food familiarity, preferences, and intake. While several bodies of research have observed food exposure of varying forms including interaction with real food as well as intangible food messages, play food has been explored very little as a mechanism of repeated visual exposure and its consequential potential impact on children's food preferences.

Despite scant research involving play foods, researchers have agreed that play food has potential to serve as an experiential teaching mechanism to positively impact a multitude of nutrition parameters (78-80). If play foods enhance children's familiarity with foods, exposure to play foods may have the same impact on food preferences and food neophobia as do other modes of exposure. While play food does not provide the opportunity for taste exposure, it does possess far more interactive exposure than does advertising and social media. Thus, it is expected that exposure to and manipulation of play food may have similar effects on a child's food familiarity and preferences as do other forms of food exposure.

Play Food as a Means of Exposure

Environmental factors, specifically those within the home and childcare settings play a large role in influencing children's eating behavior (3, 26, 27). While food preference (4), food neophobia (38, 50), and familiarity with foods (5, 22, 38) have been identified as major factors affecting food consumption of children, little research has explored play food and no published large-scale research has yet objectively explored how play foods may relate to food familiarity and neophobia, and thereby food preference and consumption. Currently, the only published research related to play food has been descriptive in nature and has suggested that children and parents interact more frequently and positively with play foods that do not represent healthful food choices. The most popular food groups represented by the play food toys included "extras", followed by fruits/vegetables, meats/alternatives, grains, and milk/dairy (79, 80). Building upon this baseline knowledge by determining the nature of play foods available in the home, the relationship between play food and preschool children's dietary preferences, maternal feeding style, and food neophobia, as well as understanding what factors may influence play food purchase could reveal a relationship with environmental factors that has not been previously identified. Such findings may potentiate changes in use of play food, both in child-care and home settings, in addition to the marketplace as a whole. In addition, this information may lead to nutrition interventions involving play food exposure as a way to enhance fruit and vegetable intake in children. Such changes could play a role in changing the profile of preschoolers eating habits, which are likely to be sustained throughout life (9, 12) and further, prevent obesity and consequential comorbidities (10, 11).

Preliminary Data

Previously-conducted preliminary research through the Playing and Learning About Your Food (PLAYFood) Project has explored the relationship of play foods to fruit and vegetable intake, liking, and degree of food neophobia in toddlers and preschool children, as well as factors related to parental play food purchase. Hansen-Petrik et al. (81) explored the effect of a one-week intervention of play food exposure, food tasting and activities on fruit and vegetable intake. At baseline, fruit and vegetable intake at lunch and afternoon snack time was recorded for one week for nineteen toddlers at the University of Tennessee Early Learning Center (ELC) for Research and Practice prior to which time all play foods were removed from the center. Throughout the following week, children participated in an intervention that combined researcher-led play with play fruits and vegetables, touching and tasting of real fruits and vegetables, and singing a song about eating colorful foods. Post-intervention follow-up monitoring revealed that children requested more servings of fruits and vegetables following the intervention compared to baseline ($p<0.01$) (Figure 1). These preliminary results suggest that children may be more likely to request and eat more servings of fruits and vegetables upon gaining familiarity with them through activities that include play food (81).

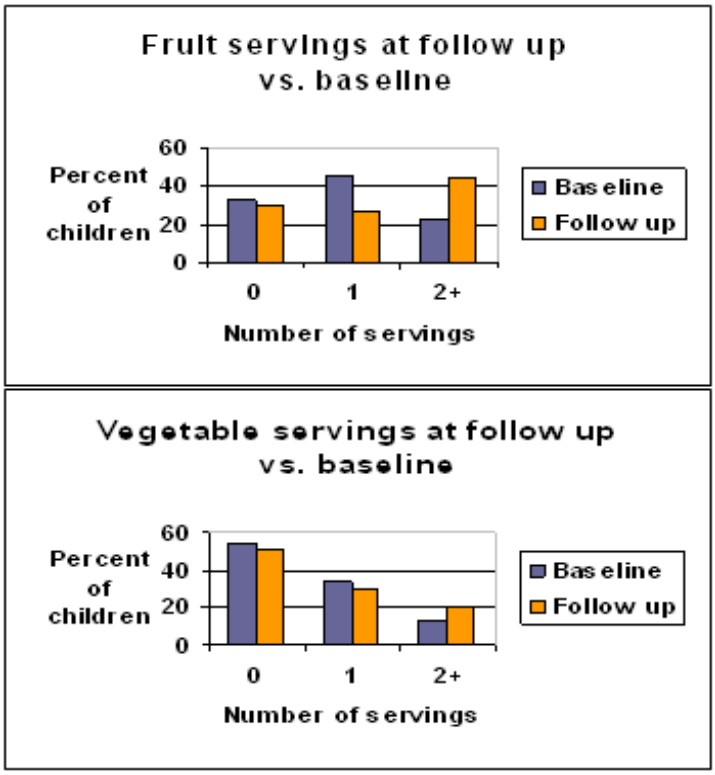

Figure 1. Fruit & vegetable servings at follow-up and baseline (pilot data). ($p<0.01$).

Another pilot study that laid the groundwork for the proposed research surveyed 15 parents and caregivers of preschool-aged children at the ELC. Survey questions included parental and child sociodemographics, parental preference and motivations behind play food purchase, role of play food in the home, children's food preference, and children's food neophobia. Results revealed a positive relationship between the importance of "healthfulness" in choosing play food and likelihood of preferring fruit or vegetable play food sets (Figure 2). In addition, there was a non-significant variation in the presence of play food in the home by gender, with 71% of female children having play foods in the home compared to 50% of male

children. Lastly, there was a non-significant trend indicating that children with more play fruits and vegetables in the home may like a greater variety of fruits and vegetables (Figure 3) (82).

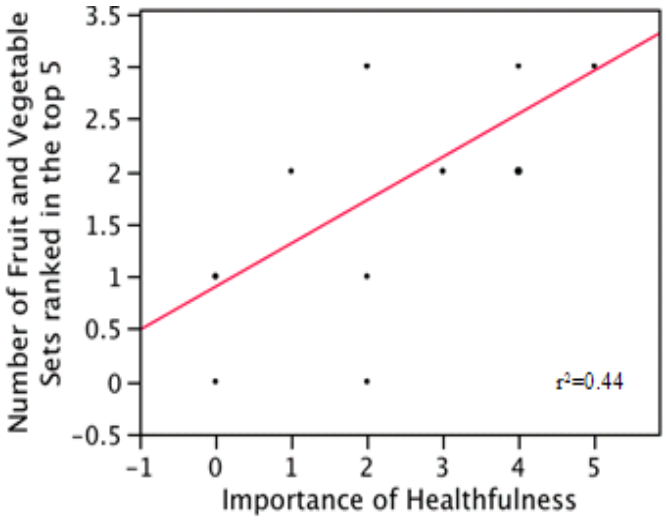

Figure 2. Relationship between the importance of healthfulness as a motivational factor and the number of fruit and vegetable play food sets ranked in the top 5 by parents/caregivers (pilot data). (p=0.01)

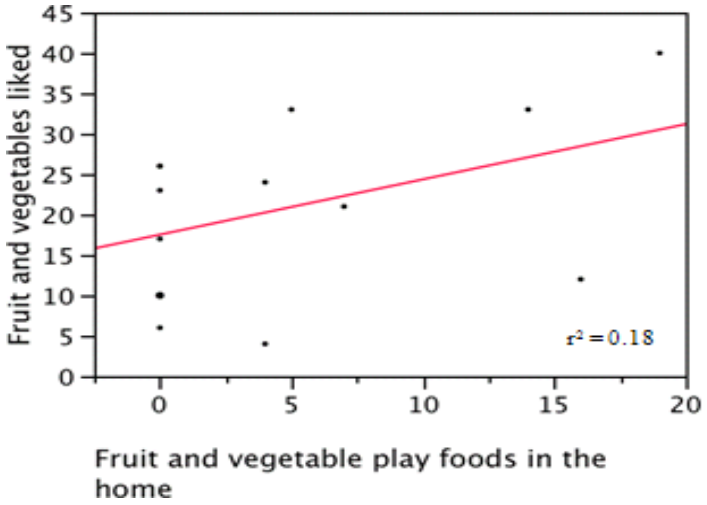

Figure 3. Relationship between number of fruit and vegetable play foods in the home to number of fruits and vegetables liked (n=13, p=0.15).

These results suggest that there may be a relationship between play food exposure and food preference, and this serves as the basis for the proposed research. While results of these small studies have not identified clear relationships, a larger and more diverse sample, as proposed, will provide a clearer picture of the potential relationship of play food with food preferences among young children.

Research Questions

The objectives of this proposed study are to:

1.) Describe the extent to which home play food availability differs by gender, age, and socioeconomic status and the extent to which child food preferences, and food neophobia differ by gender.

2.) Determine the extent to which play food exposure in the home correlates with dietary preferences in preschool-aged children.

3.) Describe factors that motivate play-food purchase preferences of mothers

4.) Describe the extent to which play food availability modulates the relationship between children's food neophobia and food preferences.

5.) Describe the relationship of maternal feeding style to food neophobia, child food preferences, and home play food availability.

List of References

1. CDC. Halting the epidemic by making health easier. 2010. Available at: http://www.cdc.gov/nccdphp/publications/AAG/pdf/obesity.pdf. Accessed: March 11, 2010.

2. Wang Y, Li J. Tracking of dietary intake patterns is associated with baseline characteristics of urban low-income African-American adolescents. *J Nutr*. 2008;138:94-100.

3. Russell CG, Worsley A. Do children's food preferences align with dietary recommendations? *Public Health Nutr*. 2007;10:1223-1233.

4. Resnicow K, Davis-Hearn M, Smith M, Baranowski T, Lin LS, Baranowski J, Doyle C, Wang DT. Social-cognitive predictors of fruit and vegetable intake in children. *Health Psychol*. 1997;16:272-276.

5. Birch LL. Effects of peer models' food choices and eating behaviors on preschoolers' food preferences. *Child Dev*. 1980;51:489-496.

6. Birch LL, Fisher JO. Development of eating behaviors among children and adolescents. *Pediatrics*. 1998;101:539-549.

7. Lineberger SE, Zajicek JM. School gardens: Can a hands on teaching tool affect students' attitudes and behaviors regarding fruit and vegetables? *Hort Technology*. 2000;10:593-597.

8. Ogden CL, Flegal KM. Changes in terminology for childhood overweight and obesity. *National Health Statistics Report*. 2010;25:1-5.

9. Ogden CL, Carroll MD, Curtin LR, Lamb MM, Flegal KM. Prevalence of high body mass index in US children and adolescents, 2007-2008. *JAMA*. 2010;303:242-249.

10. Dietz W. Health consequences of obesity in youth: childhood predictors of adult disease. *Pediatrics*. 1998;101:518-525.

11. IOM: *Dietary reference intakes*: National Academies Press; 1997.

12. Singer MR, Moore LL, Garrahie EJ, Ellison RC. The tracking of nutrient intake in young children: the Framingham Children's Study. *Am J Public Health*. 1995;85:1673-1677.

13. Piernas C, Popkin BM. Trends in snacking among U.S. children. *Health Affairs (Project Hope)*. 2010;29:398-404.

14. Cockroft JE, Durkin M, Masding C, Cade JE. Fruit and vegetable intakes in a sample of pre-school children participating in the 'Five for All' project in Bradford. *Public Health Nutr*. 2005;8:861-869.

15. Birch LL, Fisher JA, eds. *The role of experience in the development of children's eating behavior*. Why We Eat What We Eat: The Psychology of Eating. 1996, American Psychological Association: Washington DC. 113-141.

16. Hertzler AA. Children's food patterns--a review: Family and group behavior. *J Am Diet Assoc*. 1983;83:555-560.

17. Duncker K. Expiremental modification of children's food preferences through social suggestion. *J Abnorm Soc Psychol*. 1938;33:489-507.

18. Harris G. Introducing the infant's first solid food. *Br Food J*. 1993;95:7-10.

19. Reverdy C, Chesnel F, Schlich P, Koster EP, Lange C. Effect of sensory education on willingness to taste novel food in children. *Appetite*. 2008;51:156-165.

20. Addessi E, Galloway AT, Visalberghi E, Birch LL. Specific social influences on the acceptance of novel foods in 2-5-year-old children. *Appetite*. 2005;45:264-271.

21. Birch LL, Gunder L, Grimm-Thomas K, Laing D. Infant's consumption of a new food enhances acceptance of similar foods. *Appetite*. 1998;30:283-295.

22. Cooke L. The importance of exposure for healthy eating in childhood: a review. *J Hum Nutr Diet*. 2007;20:294-301.

23. Birch L, Marlin D. I don't like it; I've never tried it: effects of exposure on two-year-old children's food preferences. *Appetite*. 1982;3:353-360.

24. Obesity prevalence among low-income, preschool-aged children -- United States, 1998-2008. *Morbidity & Mortality Weekly Report*. 2009;58:769-773.

25. Watt RG, Dykes J, Sheiham A. Socio-economic determinants of selected dietary indicators in British pre-school children. *Public Health Nutr*. 2001;4:1229-1233.

26. Cullen KW, Baranowski T, Rittenberry L, Olvera N. Social-environmental influences on children's diets: results from focus groups with African-, Euro- and Mexican-American children and their parents. *Health Educ Res*. 2000;15:581-590.

27. Baranowski T, Cullen KW, Baranowski J. Psychosocial correlates of dietary intake: advancing dietary intervention. *Annu Rev Nutr*. 1999;19:17-40.

28. Byrd-Bredbenner C, Abbot JM, Cussler E. Nutrient profile of household food supplies of families with young children. *J Am Diet Assoc*. 2009;109:2057-2062.

29. Maubach N, Hoek J, McCreanor T. An exploration of parents' food purchasing behaviours. *Appetite*. 2009;53:297-302.

30. Arnas YA. The effects of television food advertisement on children's food purchasing requests. *Pediatr Int*. 2006;48:138-145.

31. Proctor MH, Moore LL, Gao D, Cupples LA, Bradlee ML, Hood MY, Ellison RC. Television viewing and change in body fat from preschool to early adolescence: The Framingham Children's Study. *Int J Obes Relat Metab Disord*. 2003;27:827-827.

32. Isler L, Popper HT, Ward S. Children's purchase requests and parental responses: results from a diary study. *J Advert Res*. 1987;27:28-39.

33. Sutherland LA, Beavers DP, Kupper LL, Bernhardt AM, Heatherton T, Dalton MA. Like parent, like child: Child food and beverage choices during role playing. *Arch Pediatr Adolesc Med*. 2008;162:1063-1069.

34. Lowe CF, Horne PJ, Tapper K, Bowdery M, Egerton C. Effects of a peer modelling and rewards-based intervention to increase fruit and vegetable consumption in children. *Eur J Clin Nutr*. 2004;58:510-522.

35. Skinner JD, Carruth BR, Bounds W, Ziegler PJ. Children's Food Preferences: A Longitudinal Analysis. *Journal of the American Dietetic Association*. 2002;102:1638-1647.

36. Baumrind D. Current patterns of parental authority. *Developmental Psychology Monograph, Part 2*. 1971;4:1-103.

37. O'Connor TM, Hughes SO, Watson KB, Baranowski T, Nicklas TA, Fisher JO, Beltran A, Baranowski JC, Qu H, Shewchuk RM. Parenting practices are associated with fruit and vegetable consumption in pre-school children. *Public Health Nutr*. 2010;13:91-101.

38. Birch L. Development of food acceptance patterns in the first years of life. *Proc Nutr Soc*. 1998;57:617-624.

39. Hughes SO, Power TG, Orlet Fisher J, Mueller S, Nicklas TA. Revisiting a neglected construct: parenting styles in a child-feeding context. *Appetite*. 2005;44:83-92.

40. Breen FM, Plomin R, Wardle J. Heritability of food preferences in young children. *Physiol Behav*. 2006;88:443-447.

41. Borah-Giddens J, Falciglia G. A meta-analysis of the relationship in food preferences between parents and children. *J Nutr Educ*. 1993;25:102-107.

42. Kroller K, Warschburger P. Associations between maternal feeding style and food intake of children with a higher risk for overweight. *Appetite*. 2008;51:166-172.

43. Kroller K, Warshburger P. Maternal feeding strategies and child's food intake: considering weight and demographic influences using structural equation modeling. *Int J Behav Nutr Phys Act.* 2009;6:78-86.

44. Spruijt-Metz D, Lindquist CH, Birch LL, Fisher JO, Goran MI. Relation between mothers' child-feeding practices and children's adiposity. *Am J Clin Nutr*. 2002;75:581-586.

45. Fisher J, Birch L. Restricting access to palatable foods affects children's behavioral response, food selection, and intake. *Am J Clin Nutr*. 1999;69:1264-1272.

46. Fisher JO, Birch LL. Parents' restrictive feeding practices are associated with young girls' negative self-evaluation of eating. *J Am Diet Assoc*. 2000;100:1341-1346.

47. Gable S, Lutz S. Household, parent and child contributions to childhood obesity. *J Home Econ*. 2000;49:293-300.

48. O'Connor T, Watson K, Hughes S, Beltran A, Hingle M, Baranowski J, Campbell K, Canal DJ, Lizaur ABP, Zacaras I, Gonzalez D, Nicklas T, Baranowski T. Health professionals' and dietetics practitioners' perceived effectiveness of fruit and vegetable parenting practices across six countries. *J Am Diet Assoc*. 2010;110:1065-1071.

49. Brody G, Stoneman Z. Selective imitation of same-age, older, and younger peer models. *Child Dev*. 1981;52:717-720.

50. Falciglia GA, Couch SC, Gribble LS, Pabst SM, Frank R. Food neophobia in childhood affects dietary variety. *J Am Diet Assoc*. 2000;100:1474-1481.

51. Russell CG, Worsley A. A population-based study of preschoolers' food neophobia and its associations with food preferences. *J Nutr Educ Behav*. 2008;40:11-19.

52. Cooke L, Carnell S, Wardle J. Food neophobia and mealtime food consumption in 4-5 year old children. *Int J Behav Nutr Phys Act*. 2006;3:14-20.

53. Cooke L, Wardle J, Gibson EL. The relationship between child food neophobia and everyday food consumption. *Appetite*. 2003;41:95-96.

54. Dovey TM, Staples PA, Gibson EL, Halford JCG. Food neophobia and `picky/fussy' eating in children: A review. *Appetite*. 2006;50:181-193.

55. Galloway AT, Fiorito L, Lee Y, Birch LL. Parental pressure, dietary patterns, and weight status among girls who are “picky eaters”. *J Am Diet Assoc*. 2005;105:541-548.

56. Milton K. Diet and primate evolution. *Sci Am*. 1993;2:86-93.

57. Pelchat ML, Pliner P. "Try it. You'll like it". Effects of information on willingness to try novel foods. *Appetite*. 1995;24:153-165.

58. Rozin P. Preference and affect in food selection. in *Preference, Behavior, and Chemoreception*; Kroeze JHA. London, 1979. p. 289-297.

59. Rozin P, Millman L, Nemeroff C. Operation of the laws of sympathetic magic in disgust and other domains. *J Pers Soc Psychol*. 1986;50:703-712.

60. Johnson SL, Bellows L, Beckstrom L, Anderson J. Evaluation of a social marketing campaign targeting preschool children. *Am J Health Behav*. 2007;31:44-55.

61. Birch LL, McPhee L, Shoba BC, Pirok E, Steinberg L. What kind of exposure reduces children's food neophobia? Looking vs tasting. *Appetite*. 1987;9:171-178.

62. Sullivan S, Birch L. Pass the sugar, pass the salt: experience dictates preference. *Dev Psychol*. 1990;26:546-555.

63. Wardle J, Cooke LJ, Gibson EL, Sapochnik M, Sheiham A, Lawson M. Increasing children's acceptance of vegetables; a randomized trial of parent-led exposure. *Appetite*. 2003;40:155-162.

64. Morris JL, Neustadter A, Zidenburg-Cherr A. First-grade gardeners more likely to taste vegetables. *Cal Ag*. 2001;55:43-46.

65. Janice RH, Stephany PP, Barbara JB, Youmasu JS, Barbara AD, Sarah JW. After-School Gardening Improves Children’s Reported Vegetable Intake and Physical Activity. *J Nutr Educ Behav*. 2006;38:201-202.

66. Farfan-Ramirez L, Diemoz L, Gong EL, Lagura MA. Curriculum intervention in preschool children: nutrition matters. *J Nutr Educ Behav*. 2011;43:

67. Morgan PJ, Warren JM, Lubans DR, Saunders KL, Quick GI, Collins CE. The impact of nutrition education with and without a school garden on knowledge, vegetable intake and preferences

and quality of school life among primary-school students. *Public Health Nutr*. 2010;13:1931-1940.

68. Sondra MP, Salisbury-Glennon J, David S, Barbara S. School gardens: an experiential learning approach for a nutrition education program to increase fruit and vegetable knowledge, preference, and consumption among second-grade students. *J Nutr Educ Behav*. 2009;41:212-217.

69. Heim S, Stang J, Ireland M. A garden pilot project enhances fruit and vegetable consumption among children. *J Am Diet Assoc*. 2009;109:1220-1226.

70. WHO. Marketing of food and nonalcoholic beverages to children. 2006.

71. Batada A, Wootan MG. Nickelodeon markets nutrition-poor foods to children. *Am J Prev Med*. 2007;33:48-50.

72. Batada A, Seitz MD, Wootan MG, Story M. Nine out of 10 food advertisements shown during Saturday morning children's television programming are for foods high in fat, sodium, or added sugars, or low in nutrients. *J Am Diet Assoc*. 2008;108:673-678.

73. Lobstein T, Dibb S. Evidence of a possible link between obesogenic food advertising and child overweight. *Obes Rev*. 2005;6:203-208.

74. Wootan M. Guidelines for responsible food marketing to children. 2005. Available at: http://www.cspinet.org/marketingguidelines.pdf. Accessed: September 12, 2010.

75. Commission FT. Interagency working group of food marketed to children. 2009. Available at: http://www.ftc.gov/os/2011/04/110428foodmarketproposedguide.pdf. Accessed: October 8th, 2011.

76. Fisher JO, Birch LL. Fat preferences and fat consumption of 3- to 5-year-old children are related to parental adiposity. *J Am Diet Assoc*. 1995;95:759-764.

77. Horne PJ, Tapper K, Lowe CF, Hardman CA, Jackson MC, Woolner J. Increasing children's fruit and vegetable consumption: a peer-modelling and rewards-based intervention. *Eur J Clin Nutr*. 2004;58:1649-1660.

78. Matheson D, Spranger K, Saxe A. Preschool children's perceptions of food and their food experiences. *J Nutr Educ Behav*. 2004;34:85-92.

79. Lynch M. Playing with food. A novel approach to understanding nutritional behaviour development. *Appetite*. 2010;54:591-594.

80. Lynch M. Familiarizing with toy food: preliminary research and future directions. *J Nutr Educ Behav*. 2011.[Epub ahead of print].

81. Hansen-Petrik MB, Tucker AP, Nodell HA. The influence of play fruits and vegetables on fruit and vegetable intake among toddlers. *FASEB J*. 2007;21:671.

82. Ozier A, Zitt M. Relationship of parental play food preferences to food neophobia and dietary preferences in preschoolers. 2009.

SECTION II

DESCRIBING HOME PLAY FOOD AVAILABILITY AMONG PRESCHOOLERS WITHIN A NUTRITIONAL CONTEXT: RELATIONSHIPS WITH GENDER, FOOD PREFERENCES, FOOD NEOPHOBIA, AND MATERNAL FEEDING STYLES

Disclosure

This article will be submitted to the Journal of Nutrition Education and Behavior for review.

Authors contributions: Jenna Waters conducted the research and co-wrote the manuscript, and Melissa Hansen-Petrik formatted and designed the research, co-wrote the manuscript.

Abstract

The current study describes home play food availability and the relationship play foods may have with food familiarity and preference among preschool-aged children. A convenience sample of mothers of children ages 2 to 5 years (n=181) were recruited from a children's consignment event in Knoxville, Tennessee, to complete a survey to assess home play food availability, children's dietary preferences, maternal feeding style, and food neophobia. A validated food preference scale, the Children's Food Neophobia Scale (CFNS), and the Caregiver's Feeding Styles Questionnaire (CFSQ) were the tools used to assess children's food preferences, child food neophobia, and maternal feeding styles, respectively. Overall, 80.7% of children had play food at home, averaging 32 distinct items per household. The most commonly reported play foods were vegetables, followed in descending order by fruit, grains, sweets/fats, and protein MyPlate food groups. Girls had significantly more play food items at home than boys, specifically within the fruit, vegetable, grain, protein, and sweets/fats categories. No significant relationships were observed between home play food variety and number of foods "liked" within food groups and play food availability did not modulate the inverse relationship between food neophobia and number of foods liked. Compared to mothers with an authoritarian feeding style, mothers who exhibited the indulgent feeding style reported having children who were significantly less food neophobic, and had a lower reported preference for foods classified as sweets/fats. Additionally, mothers with an uninvolved feeding style had children with significantly fewer play food vegetables represented compared to indulgent mothers. Results from this present study describe an initial investigation into potential relationships between play food and a multitude of variables including gender, maternal feeding style, food preferences, and food neophobia, which merit further study via an experimental approach.

Introduction

Escalating rates of overweight and obesity continue to be nationwide problems not only among adults, but also children as young as infancy, evidenced by the tripling of childhood obesity prevalence between 1980-2008 (1). Current data indicate that 21.2% of preschool-aged children are overweight or obese based on BMI for gender and age (2). This trend, which has implications for long-term health, has coincided with the evolution of children's physical activity and dietary intake patterns. Compared to three decades ago, dietary intake patterns of children have shifted towards more energy-dense, less nutrient-dense foods in greater quantities (3). Children are consuming a significantly higher proportion of calories from energy-dense snack foods including candy, desserts, salty snacks, and sweetened beverages, and significantly fewer calories from nutrient-dense foods such as fruits and vegetables (3, 4). Research indicates that eating habits formed during childhood persist throughout adolescence and into adulthood (5), thus underscoring the importance of promoting development of healthy eating habits in early childhood.

A multitude of environmental factors are related to children's food intake patterns. Among these factors are socioeconomic status (4, 6), home and pre-school environment (7-12), influence of parents (13-17), advertising and media (18, 19), and a child's preference and familiarity with foods (11, 20, 21). Russell and Resnicow have suggested that food preferences are one of the most significant determinants of children's food intake (11, 20), a variable that other research has strongly associated with food familiarity (16, 22). In addition, because children tend to eat what they like (11), focusing on factors that influence the environmental aspect of 'preference' by changing what children desire to eat could be an extremely effective avenue towards improving children's dietary patterns and, therefore, general health and well-

being. It has been suggested that children's food preferences are primarily learned through experiences with foods (16, 23-25), which can include but are not limited to domains of parental feeding behaviors, peer influence, media and advertising, and food exposure.

The way in which parents behave during child feeding has also been linked to children's dietary intake and weight status in several studies (13, 26-28). Authoritarian feeding styles characterized by specific strategies of restriction, rewarding, and pressure are associated with a higher intake of unhealthy foods (27), lower intake of fruits and vegetables, child weight gain (26), and higher BMI and total fat mass in children (28). In contrast, researchers have identified authoritative feeding styles as having a positive impact on children's dietary intake patterns. Specific authoritative feeding strategies of monitoring, child control, and parental modeling are associated with lower intake of unhealthy foods, and a higher intake of healthy foods (27), specifically fruits and vegetables (26, 27, 29). Additionally, permissive feeding styles of indulgent and uninvolved have been associated with lower intake of fruits, vegetables, and dairy foods, as well as higher child BMI (30). While it may be inferred that the parental feeding styles are similarly related to children's food preferences, little research has specifically explored the relationship of parental feeding styles with food preferences. The one study that has been published indicates that children who were forcefully encouraged by parents to consume vegetables (authoritarian feeding style) had a lower preference for vegetables (31).

Researchers have suggested that repeated exposure to a food, through a multitude of sensory mechanisms including visual, taste, and touch exposure, is positively associated with food preferences in children (23, 25). Visual food exposure may occur through a variety of means including picture books, games, gardening, internet and gaming media, and toys, to name a few. Although visual exposure is not associated with taste preferences, recent studies have

suggested that enhanced visual preference may increase the likelihood that taste exposure will occur (32, 33). Specifically, repeated tasting of a food has been associated with increased taste preference for that food in children (23, 34). In this way, repeated exposure to a variety of foods may enhance the number of foods a child likes. Food neophobia, which is described as the reluctance to eat or the avoidance of new foods (16), has been strongly associated with everyday food preferences of preschool children (35). Higher degrees of food neophobia have been associated with a lower intake of fruits and vegetables (36) as well as greater dietary preferences for fat, energy, and sugar compared to children with lower degrees of food neophobia (35). Interventions that enhance visual as well as taste exposure to a variety of foods may be beneficial in increasing children's acceptance of a variety of healthy foods and, thereby, offset neophobia and promote overall health.

Little research has explored whether interaction with play foods is an effective means of exposure to enhance food familiarity and preference while decreasing food neophobia. We previously conducted a preliminary study that showed toddlers in a childcare setting requested more servings of fruits and vegetables following a 3-week intervention with play fruits and vegetables (37). Qualitative studies have described observations during play in toy kitchens (38-40), but to our knowledge no previously published work has gathered objective data on play foods available to young children in the home setting or attempted to relate home play food availability to food preferences.

Thus, the objectives of this study were twofold: 1) to describe the profile of home play foods available among preschool-aged children in the context of USDA MyPlate food groups and 2) to describe the relationship of home play food availability with food preferences, maternal feeding style, and food neophobia in order to further explore the nature of the proposed

relationship between play food availability and food preferences. This endeavor is a component of the PLAYFood (Playing and Learning About Your Food) Project, which aims to explore the potential role of play in developing and sustaining eating habits in early childhood. The findings of this and similar research may have implications for planning educational interventions or shaping policy related to pretend play. We hypothesized that home play food availability would be positively associated with food preferences and be inversely associated with food neophobia. In addition, we hypothesized that play food availability would differ by gender and maternal feeding style.

Methods

Subjects

Prior to conducting the study, the research protocol was approved by the University of Tennessee Institutional Review Board for Protection of Human Subjects. Subjects included a convenience sample of 200 mothers of preschool-aged children, recruited from a local children's consignment event. Nineteen surveys were excluded due to conflicting and unusable data, thus 181 surveys were used in final data analysis. Target sample size was determined based on power analysis of results from a pilot survey designed to detect gender differences in home play food availability and the relationship of play foods to food preferences. The sample size exceeded the minimum sample size of n=168 determined by the power analysis of correlations between play food and food preferences.

Data Collection

Data collection took place in April 2011 over the course of 3 days (Thursday, Friday, and Monday) at a local biannual children's consignment event with approximately 25,000 people in attendance. Attendees were invited to participate in the study by a researcher while waiting in line to gain entry into, or check-out at the event. Attendees were approached consecutively starting at the front of the line and working towards the back, until the target sample size had been reached. Eligibility was determined by asking a series of two screening questions. These included 1.) Are you the mother of a child between the ages of 2-5 years old? and 2.) Are you the primary caregiver? For the purposes of this study, "primary caregiver" was defined as being the primary caretaker for at least four days per week. Mothers answering "yes" to both questions

were invited to read the study information sheet which included informed consent. If they agreed to participate in the study a coded survey was distributed, based on their child's gender, in order to assure equal gender representation. If a participant had more than one child between the ages of 2-5 years old, they were instructed to choose their oldest child. The research team explained that they were interested in understanding pretend play in preschool children, and were available to answer questions about all documents when and if participants needed clarification. When participants had completed the survey, which took approximately 15-25 minutes, they alerted a research team member who then reviewed the survey to ensure all sections were complete. Participants who turned in a completed survey had their hand stamped to ensure that no participant completed more than one survey. As an incentive, all participants were given a $10 store gift card at the time of survey completion.

Instrumentation and Measures

Instrumentation

The survey was pilot tested with parents of preschool-aged children (n=15) enrolled in the University of Tennessee Early Learning Center for Research and Practice in 2009 to test survey readability and comprehension as well as generate data for power analysis. Content validity was established through survey review by an expert panel which resulted in minor survey revisions. Additional content areas were added to address the research questions of the main study. The final survey included questions regarding demographics, home play food availability and habits, dietary preferences, food neophobia, maternal feeding practices, and personal concern for health.

Measures

In the first section of the survey, participants were asked to report their own and their child's demographic characteristics. Demographic variables included participant's age, education level, average household income, and employment status. Subjects also reported their child's gender, age, and ethnicity.

To determine play food purchase preferences and motivations, participants were asked to rate on a 5-point Likert scale how important certain motivating factors were in purchasing play food for their child (i.e. healthfulness, bright colors, price, brand name, etc.). To further understand play food purchasing behaviors, participants were also asked to indicate where they would be most likely to purchase play food from a list of store names and sites where play food may be sold. An open-ended option, where mothers could fill in places of purchase, was also available.

Children's dietary preferences were assessed by a 190 item food preference scale adapted for parents and guardians from a validated measure developed by Wardle, et al (41). The survey included an extensive list of a variety of foods and mothers were to indicate how much the child likes or dislikes the food items based on a 5-point Likert scale ("dislikes extremely", "dislikes a little", "neither like nor dislikes", "likes a little", "likes extremely"). Mothers were also given the option of "never tried it" on the scale. Mothers reported their child's exposure to specific play food items by checking a box next to each food item on the food preference scale if a corresponding play food was present in the home.

Children's food neophobia was assessed by the Children's Food Neophobia Scale (CFNS), a validated tool from Russell and Worsley (35). Mothers ranked on a 7 point scale how much they agreed or disagreed with statements related to their child's eating characteristics. For example, statements include "If my child doesn't know what is in a food, she won't try it" and "My child will eat almost anything". The score ranges from 10-70 with higher scores indicating a greater degree of food neophobia.

Child feeding practices were assessed by the Caregiver's Feeding Styles Questionnaire (CFSQ), a validated 19 item scale with questions about feeding behavior (17). For example, questions include, "How often during a meal do you tell the child to eat at least a little bit of food on their plate?" and "How often during a meal do you beg the child to eat dinner?" These were rated on an ascending 5-point Likert scale, ranging from "never" to "always". Means and mean splits were calculated to define the parameters of high and low demandingness and responsiveness. Once categorized by these two major dimensions of feeding styles, mothers were further categorized into one of four categories: Authoritative, Authoritarian, Indulgent, or Uninvolved.

Maternal concern for healthy eating was assessed by a validated survey question adapted from Boutelle et al (42). Mothers ranked ("not at all"-"very much") how much they care about eating healthful food and how much they care about their child eating healthful foods. This question was purposefully placed last in the survey, so as to avoid the potential of bias in answering other questions.

Data Analysis

After excluding incomplete surveys, data were manually entered into a Microsoft Excel® spreadsheet by the primary investigator and trained research assistants. After independent review of all entries for accuracy by a second research assistant, data were then analyzed using PASW Statistics software (version 18.0, July 2009). Descriptive statistics were generated on the demographic characteristics of the sample participants and their preschool-aged children. Play foods were categorized according to USDA MyPlate food groups and frequency data were generated for each food group. Mean scores were determined for the food preferences scale and concern for healthy eating questions. Responses to questions on the CFNS and CFSQ were scored based on the specified scoring mechanisms for the respective instruments. Correlation analysis examined the relationship between preschooler play food exposure in the home (by food group) and food preferences, as well as the relationship between play food exposure by food group and food neophobia. Descriptive statistics, specifically t-tests and MANOVA were used to describe factors related to adult-play food purchase preferences as well as gender differences in play food exposure, food preferences, and food neophobia. To determine significance, $p < 0.05$ was used for all analyses.

Results

The survey sample consisted of predominantly white (95.6%), middle-income mothers (n=181) of preschool-aged children in East Tennessee (Table 1). Male and female children were equally represented and had a mean age of 3.4 years. The majority of children (80.7%) in the sample had at least some play foods in the home. As shown in Figure 4, girls were significantly more likely than boys to have play food, at 89.9% and 71.7%, respectively (p=.002). The most frequently reported play food items were (in descending order by frequency) from the vegetable, fruit, grain, sweets/fats, protein, and dairy categories (Figure 5). Among children whose mothers reported play food, girls had significantly more total play food items at home than boys, with 34±21 play food pieces compared to 30±18 items on average, respectively (p=.008). Specifically, girls had significantly more play food items than boys from the fruit, vegetable, grain, protein, and sweets/fats MyPlate (43) food groups ($p<0.05$). There were no significant differences in numbers of play foods available by age (Figure 6).

Table 1. Demographic Characteristics of the Participants and their Children

	N	Percentage
Child		
Gender		
Male	92	50.8
Female	89	49.2
Age		
2	52	28.7
3	41	22.7
4	55	30.4
5	33	18.2
Ethnicity[a]		
White non Hispanic	173	95.6
Hispanic	7	3.9
Black non-Hispanic	4	2.2
Other[b]	3	1.7
Playfood		
Has playfood at home	146	80.7
No playfood at home	35	19.3
Mother		
Age		
<20	4	2.2
20-24	14	7.7
25-29	46	25.4
30-39	106	58.6
40+	10	5.6
Highest Education Level		
Some High School	35	19.3
High School diploma or GED	41	22.7
2-year degree, trade school	30	16.6
Some 4 year college	49	27.1
Bachelor's degree	25	13.8
Graduate, professional degree	1	0.6
Annual household income		
≤ $20,000	18	10.0
$20,001-$30,000	18	9.9
$30,001-$40,000	18	9.9
$40,001-$50,000	25	13.8
$50,001-$75,000	50	27.6
$75,000-$100,000	35	19.3
Over $100,000	14	7.7

GED indicated General Equivalency Degree. [a]The ethnicity sample sizes do not add up to the total sample size because participants were allowed to choose more than one. Therefore, the percentage is over 100%. [b]The "Other" ethnicities were evenly distributed between "mixed", "Palestinian/Caucasian", and "Scottish/Jamaican/Brazilian"

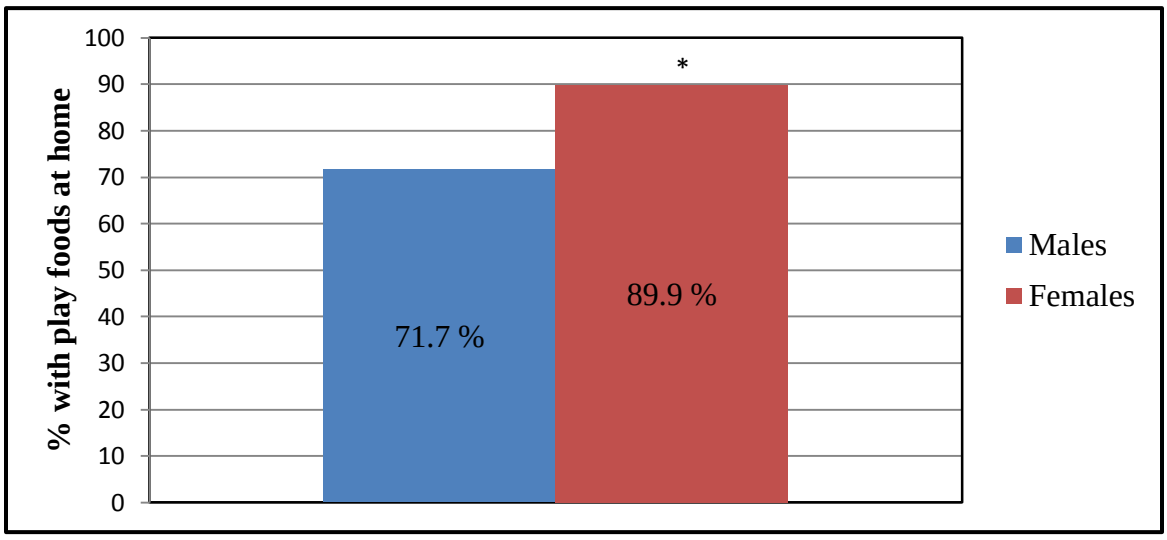

Figure 4. Percentage of play foods at home by gender.
*Significantly different at p≤ .05.

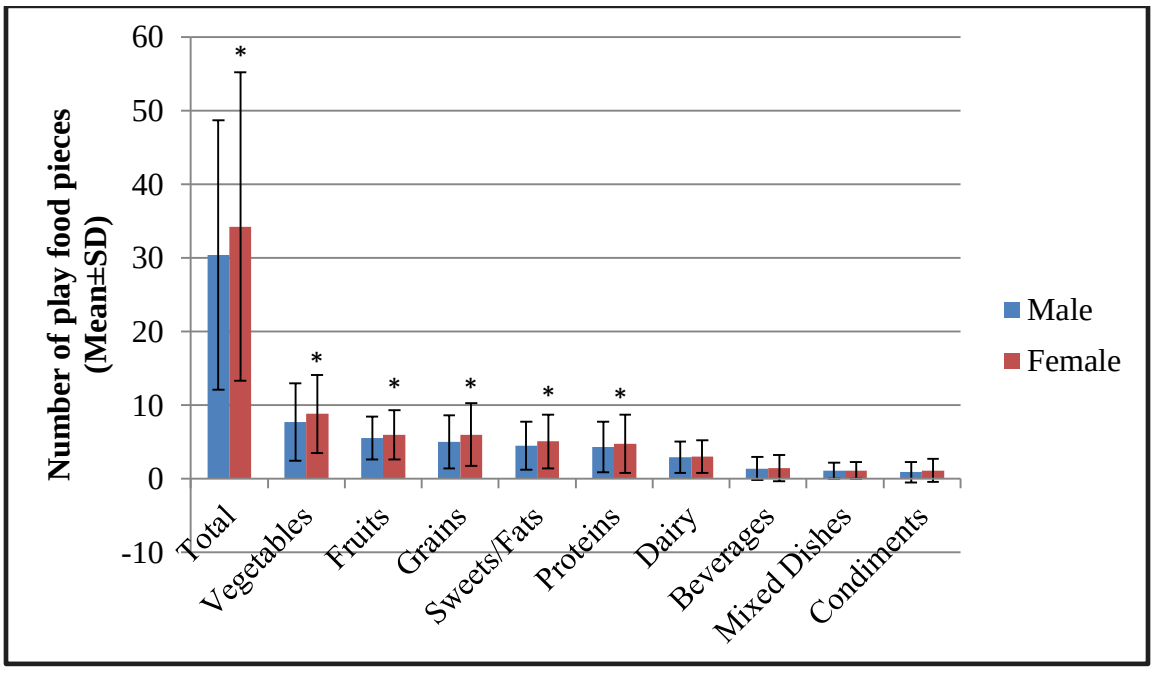

Figure 5. Play food availability by gender.
*Significantly different at p≤ .05.

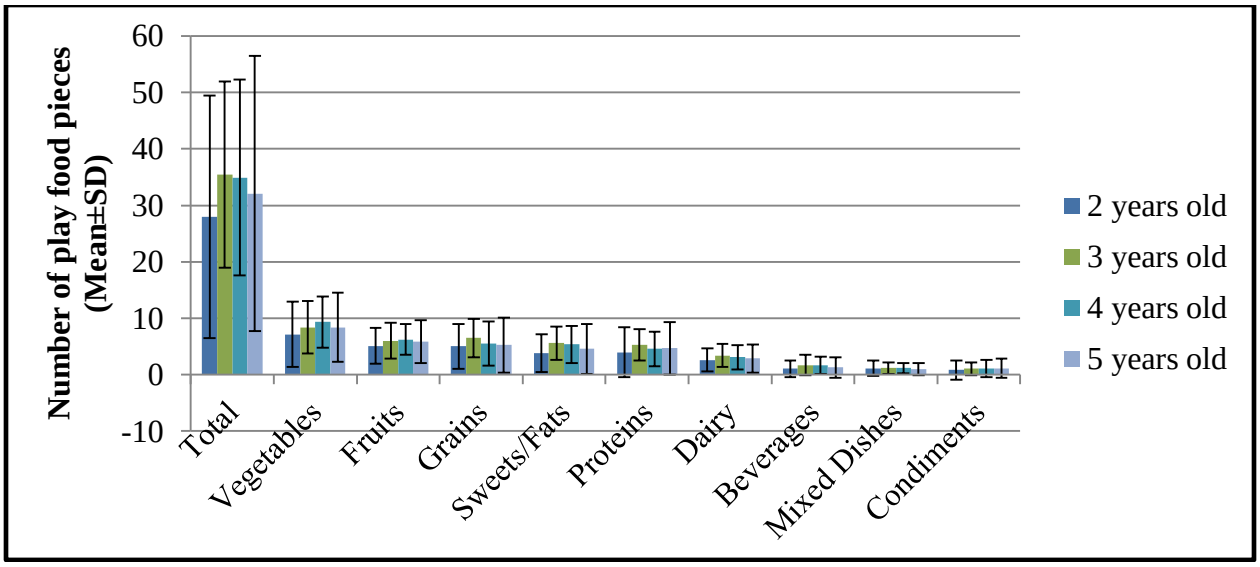

Figure 6. Play food availability by age.
There were no significant differences in home play food availability by age ($p<0.05$).

Play food purchasing behaviors

Characteristics of play food that mothers rated highest as motivations (top 50% of mean scores) for purchasing play foods included fun, variety, interactive, educational value, price, and bright colors and appealing textures (Table 2). Although the importance of health as reported by mothers was positively correlated with the rating of 'healthfulness' as a motivating factor in play food purchases(r=.249, p=.001), there were no significant relationships between either of these variables and the types of play food available in the home. However, a non-significant positive relationship existed between the rating of healthfulness as a motivation in selecting play foods and the number of vegetable play foods reported in the home (r=.142, p=.057). Also, aside from the three major toy retailers (Wal-Mart, Target, Toys R' Us), consignment sales and yard sales were cited as the next most common source of play food purchases.

Table 2. Motivations in Mothers' Play Food Purchase Decisions

	Mean±SD
Fun	4.50±0.80
Variety	4.35±0.83
Interactive	4.24±0.89
Educational value	4.23±0.92
Price	4.18±0.98
Bright colors and appealing textures	4.10±0.94
Healthfulness	3.92±1.00
Exposure to foods of other cultures	3.52±1.11
Food my child likes	3.47±1.23
Food I like	2.80±1.32
Brand name	2.10±1.14
Religious preference	2.01±1.19

Participants ranked each of these factors on a scale of 1 ("not important at at all") through 5 ("very important"). Values shown indicate overall ratings (mean±SD).

Play food, food preferences, and neophobia

As shown in Table 3, there were no significant relationships between play food availability by food group and number of foods "liked," which was defined as a food preference rating of 4 or 5 within each food group. Lastly, the strong inverse relationship between food neophobia and overall food preference rating (r=-.389, p=0.00 was not mediated by the addition of play food into the statistical model (r=.018, p=.792) (Table 4).

Table 3. Relationship Between Home Play Food Availability and Food Preferences by Food Group

	Number "Liked"[a]	
	r	**p**
Fruit	0.110	0.141
Vegetables	0.105	0.160
Grains	0.046	0.535
Protein	0.030	0.687
Dairy	0.061	0.416
Mixed Dishes	0.035	0.642
Sweets/Fats	0.012	0.873
Beverages	0.098	0.188
Condiments	0.036	0.626

[a]"Liked" is defined as a rating of a 4 or 5 on the food preference scale

Table 4. Relationship Between Children's Food Neophobia and Food Preferences with and without Play Food

	Overall Food Preferences		
	R	**Beta**	**P**
Neophobia	0.389	-0.389	0.000
Neophobia & Play Food	0.389	0.018	0.792

Maternal Feeding Style

As shown in Table 4, there was a non-significant trend toward a difference in reported overall preference for foods in the sweets/fats category between children of mothers with indulgent compared to authoritarian feeding styles (p=.055). In addition, there was a significant difference in vegetable play food availability, specifically between children of mothers with uninvolved compared to indulgent feeding styles (p=.04). Several additional significant differences were identified among food preferences, play food availability, and neophobia when feeding styles were categorized by the two major dimensions of demandingness and responsiveness rather than separated into four specific feeding styles (Table 5).

Table 5. Relationship of Maternal Feeding Style with Children's Food Neophobia, Food Preferences, and Home Play Food Availability

	Uninvolved n=24	**Indulgent n=67**	**Authoritarian n=63**	**Authoritative n=26**	**P**
Percent with Play Food (n=180)	75.0%	89.6%	73.0%	80.8%	0.101
	Mean±SD	**Mean±SD**	**Mean±SD**	**Mean±SD**	
Total Play Food Items (n=180)	24.13±19.96	31.64±24.58	23.61±19.04	30.38±19.91	0.281
Fruit	4.25±3.15	5.55±3.70	4.24±3.63	5.35±3.74	0.234
Vegetables	5.70±4.95[a]	8.67±6.42[b]	5.76±5.12[ab]	7.07±4.72[ab]	0.040*
Protein	3.88±3.83	4.45±4.67	3.19±3.05	4.42±3.03	0.278
Grains	4.54±4.19	5.36±4.67	3.89±3.67	5.73±4.14	0.156
Dairy	2.12±1.96	2.94±2.34	2.29±2.22	2.54±2.32	0.316
Mixed Dishes	.75±.89	1.15±1.25	.82±.98	.88±1.07	0.248
Sweets/Fats	3.69±3.46	4.24±3.90	3.86±3.51	4.88±3.58	0.436
Beverages	1.0±1.53	1.33±1.71	1.19±1.66	1.35±1.49	0.651
Condiments	.50±1.06	1.03±1.75	.71±1.07	1.11±1.48	0.292
	Mean±SE	**Mean±SE**	**Mean±SE**	**Mean±SE**	
Neophobia (n=177)	35.5±12.8[ab]	31.6±12.83[a]	39.1±12.27[b]	33.00±12.56[ab]	0.009*
Food Preference Ratings (n=180)	3.96±.47	3.87±.57	3.85±.55	3.79±.57	0.769
Fruit	4.45±.14	4.35±.08	4.34±.08	4.19±.13	0.604
Vegetables	3.96±.20	3.82±.12	3.80±.12	3.55±.19	0.503
Protein	4.22±.14	4.12±.08	4.14±.09	3.99±.14	0.707
Grains	4.39±.10	4.25±.06	4.37±.06	4.35±.09	0.474
Dairy	4.52±.11	4.41±.06	4.53±.07	4.38±.10	0.505
Mixed Dishes	4.34±.20	4.23±.12	4.29±.12	4.01±.19	0.618
Sweets/Fats	4.41±.12	4.25±.07	4.53±.07	4.29±.11	0.055
Beverages	4.52±.14	4.46±.08	4.61±.09	4.28±.14	0.278
Condiments	4.08±.18	3.91±.11	3.99±.11	3.88±.18	0.844

* Significantly different ($p<0.05$)

a,b Different superscripts indicate which values are significantly different ($p<0.05$).

Table 6. Relationship of Dimensions of Maternal Feeding Style with Home Play Food Availability, Children's Food Neophobia, and Children's Food Preferences

	Demandingness (r)	**Responsiveness (r)**
Number of play food items	-0.109	0.133
Neophobia	0.307**	-0.259**
Importance of health	0.115	0.192**
Food Preferences	-0.047	-0.019
Fruit	-0.056	-0.042
Vegetables	-0.051	-0.028
Protein	-0.022	-0.053
Grains	0.149*	-0.076
Dairy	0.075	-0.124
Mixed Dishes	0.001	-0.063
Sweets/Fats	0.168	-0.215**
Beverages	0.016	-0.085
Condiments	-0.023	0.001
Play food availbility	-0.109	0.133
Fruit	-0.155	0.141
Vegetables	-0.197	0.202
Protein	-0.105	0.133
Grains	-0.077	0.146
Dairy	-0.136	0.123
Mixed Dishes	-0.169	0.145
Sweets/Fats	0.015	0.071
Beverages	-0.070	0.068
Condiments	-0.060	0.096

* $p<0.05$

** $p< 0.01$

Discussion

While research suggests that multiple exposures to a new food can positively influence a multitude of factors including children's food preferences, food intake, and degree of food neophobia (24, 28, 44-46), little research has explored the potential properties of play food as a proxy for exposure to enhance development of healthful eating habits among young children and, thereby, promote healthy weight and reduce risk of chronic disease. Previously published work has primarily involved observations of children playing with play foods in a play kitchen (38-40) and one preliminary study examined the effectiveness of a play food intervention in increasing fruit and vegetable intake in a childcare setting (37).

The present study of predominantly white, middle-income mothers begins to objectively describe the characteristics and potential roles of play food in the homes of preschool-aged children. The results suggest play foods are commonly found in the home of preschool-aged children, with overall availability and composition varying by child gender. Overall, vegetable play foods were most commonly reported by mothers followed in descending order by fruit, grains, sweets/fats, and protein categories. This contrasts with results of a qualitative analysis of online YouTube videos of children in play kitchens reported by Lynch (39). In that study, the "extras" group including sweets and fast food was reported as most popular while fruits and vegetables combined were second most popular. The observed difference in play food profiles reported in these studies could be due to differences in each study design and sample, although that is difficult to quantify as sociodemographic characteristics were not available for comparison to present findings. Our reporting instrument may have provided more comprehensive results as it includes an extensive listing of food items, whereas play food items in Lynch's study were ranked qualitatively according to popularity assessed by appearance in

online videos. However, that work does have the advantage of direct observation versus self-report. Future studies which comprehensively quantify home play foods through direct observation will be needed for a clearer picture.

The characteristic of "healthfulness" was ranked seventh on a list of twelve play food characteristics that motivate mothers in making purchase decisions. Healthfulness was preceded by fun, interactive, educational value, price, and bright colors and appealing textures in that order. Thus, it seems that many mothers consider various other factors before healthfulness in making play food purchasing decisions.

Based on pilot data, it was expected that girls would be more likely than boys to have play food in the home, and this was verified in the present study. Furthermore, gender differences in home play food availability were observed among food groups. Specifically, significant differences in home play food availability by gender were observed in the fruit, vegetable, protein, grain, and sweets/fats category. Although no significant differences were observed in play food availability by age, the potential role of older siblings in effecting home play food availability was not explored.

It has been established that repeated food exposure can have an impact on children's food preferences, via both visual and taste forms of exposure (21, 46, 47). However, the results reported here do not indicate the presence of a relationship between home play food availability and foods "liked" by children within food groups. It was expected, based on pilot data, that a significant positive relationship would be observed between home availability of play fruits and vegetables with number of fruits and vegetables, but it was not. The findings in the present study may be due to the small number of participants who reported no play food at home (19.3%),

which lessened the potential for identifying a relationship, if one exists. Additionally, this study did not quantify the amount of time children spend playing with play foods or the quality of the play, which would likely be important factors in gauging influence on food acceptance. The qualitative report describing YouTube videos freely available on the internet suggests that children and parents interact more frequently and positively with play foods representing fast foods, sweets, and non-nutritive beverages compared to other foods (39). That finding could be unique to the sample selected in that particular study. Nevertheless, the mere presence of play foods in the home as reported here is likely inadequate to exert an effect, but is a starting point for objective examination of a potential relationship of play foods with food preferences.

Another variable explored was food neophobia. Food neophobia is described as the reluctance to eat, or the avoidance of new foods (16) and has been strongly associated with children's food preferences (35) and consumption (36). Past research has indicated that food neophobia is related to familiarity with food items and thus, seems to be positively influenced by exposure to novel foods (48-50). In other studies, an inverse relationship has been observed between different forms of sensory food exposure and food neophobia (20, 48). Assuming play food as a proxy for 'exposure', this study included assessment of food neophobia to explore the potential role for home play food availability as a modulator of food neophobia (as measured by the CFNS) in predicting number of foods liked. While this study confirmed the strong association between food neophobia and children's food preferences set forth in previous studies (35), the relationship was not modulated by the presence of play food in the home. It is possible that interactions with play foods, versus presence, may modulate neophobia to enhance food preferences, but that variable was not evaluated in the present study.

Researchers have suggested that maternal feeding style has a significant impact on a multitude of factors including children's dietary intake, preferences, and weight status (13, 26-28). Baumrind et al. (13) identified and categorized general parenting styles as 'authoritarian', 'authoritative', 'indulgent' and 'uninvolved', based on the level of two underlying dimensions; demandingness and responsiveness. Demandingness refers to extent to which parents exhibit control, maturity demands, and supervision in their parenting, and responsiveness refers to the extent to which parents show warmth, acceptance and involvement towards the child (17). These parenting styles have also been used to describe parents' feeding styles (13). 'Authoritarian' is characterized by high demandingness and low responsiveness, and can specifically refer to a controlling feeding style in which the parent restricts or forces the child to eat certain foods. 'Uninvolved' feeding behavior is characterized by low demandingness and low responsiveness. 'Authoritative' behavior is a balance of these two, characterized by high demandingness and high responsiveness, in which parents express warmth and guidance, recognize their child's hunger and satiety cues, and respond accordingly to such messages. Lastly, 'indulgent' feeding behavior is distinguished by low demandingness and high responsiveness (13, 17).

The results of this study suggest that maternal feeding style is related to several variables including children's food neophobia, children's food preferences, and play food availability in the home. There was a trend towards higher play food ownership among children of mothers classified as having the "indulgent" feeding style (89.6%) compared to uninvolved (75%), authoritarian (73%), and authoritative (80.8%), though this was not statistically significant ($p=0.10$). Children of mothers classified as having the 'indulgent' feeding style also had significantly more vegetable play foods in the home compared to children of uninvolved mothers and had a near significant lower reported preference for sweets/fats and degree of food

neophobia than children of mothers with an 'authoritarian' feeding style (p=0.055). Thus, mothers with a more passive, yet still responsive, approach reported more vegetable play foods than mothers with a passive and non-responsive approach. This aligns well with previously-published research reporting an association of the uninvolved feeding style with lower intakes of fruits and vegetables (30). Additionally, mothers with a more passive approach to feeding reported that their children liked sweets/fats significantly less and had less fear of new foods than children of mothers who reported specific feeding behaviors of restriction, rewarding, and pressure with their children. This aligns with past research which indicates that authoritarian feeding styles are associated with higher consumption of "unhealthy" foods among children (27, 51, 52).

In teasing apart the four categories of feeding styles and focusing on the broader dimensions of demandingness and responsiveness, several additional significant relationships were observed. These relationships existed among multiple variables including child food neophobia, the importance of health to mothers, as well as specified categories of food preferences and play food pieces present in the home. Child food neophobia was positively related to the behavioral dimension of demandingness. The opposite was true for mothers who were more responsive, which was inversely related to children's food neophobia, and preference of foods within the sweets/fats category. Because no previous studies have explored the connection between these parameters and the larger dimensions of maternal feeding behaviors, it is hard to make assumptions about these findings. However, it is interesting to note that when categorized into the four major feeding behaviors, significant differences were noted between 'indulgent' and 'authoritarian' styles, which have low and high levels of demandingness, respectively. The 'indulgent' feeding style was inversely associated with food neophobia and

preference for sweets/fats, while the 'authoritarian' feeding style was associated with higher levels of food neophobia and preference for sweets/fats. Generally, the 'authoritarian' feeding style has been associated with negative parameters, including greater intake of unhealthy foods (27), lower intake of fruits and vegetables, child weight gain (26), and higher BMI and total fat mass in children (28). The feeding dimension of demandingness was also inversely but non-significantly associated with lesser play food availability in the fruits, vegetables, protein, grains, dairy, and mixed dishes categories. Additionally, responsiveness was positively related to mothers' reported importance of health ($p<0.01$) and play food availability (NS) in each of the aforementioned categories. While no research has focused on the relationships within the broader dimensions of demandingness and responsiveness, this research makes sense within the context of conclusions made on the four feeding styles discussed previously. This is an area that should be explored in future research.

Limitations to the Study

The findings of this study should be considered with the limitations in mind. The primary limitation of this study is the cross-sectional design which relies on self-reported data. Also, because the survey was distributed to a convenience sample, and our sample was predominantly white, middle-income mothers, it is not representative of the general population, and therefore limits generalizability. While we did establish content and construct validity, other limitations include the fact that we did not quantify play food items, assess the quality of interaction with play foods, nor measure food intake. Future research will likely need to validate reported play food items against actual play food inventory in the home.

Despite these limitations, the strengths of this study included the use of several existing validated instruments including the Children's Food Neophobia Scale (35), Food Preference Scale (41), and the Caregiver's Feeding Styles Questionnaire (17) to test children's food neophobia, food preferences, and maternal feeding styles respectively. In addition, this study was among the first to explore the potential relationships between play food and a multitude of factors related to children's food preferences.

Implications for Research and Practice

The realm of pretend play involving toy foods or play foods has been a very limited area of research. The present study lays the ground work for future research related to the role of play food in development of food preferences during childhood. Because past research has studied the effects of multiple food exposures on several variables related to food neophobia, food preferences, and food consumption in children, play food is a natural avenue for further exploration. First, describing the background and potential interactions of play food with other variables that mediate food preferences, which this research has begun to do, is essential to furthering knowledge in this area. The limited available literature suggests that pretend play may be a useful mechanism of exposure to new foods, as well as medium for familiarizing children with a variety of foods and impact eating behaviors (38-40). Thus, experimental and interventional studies, involving actual interactions with play foods, are needed in order to more clearly delineate the existence of a relationship between play food exposure and food preferences in preschool-aged children. Additionally, further exploration as to how maternal feeding style

may interact with play food availability in development of dietary intake patterns and preferences in early childhood is warranted.

References

1. CDC. Halting the epidemic by making health easier. 2010. Available at: http://www.cdc.gov/nccdphp/publications/AAG/pdf/obesity.pdf. Accessed: March 11, 2010.

2. Ogden CL, Carroll MD, Curtin LR, Lamb MM, Flegal KM. Prevalence of high body mass index in US children and adolescents, 2007-2008. *JAMA*. 2010;303:242-249.

3. Piernas C, Popkin BM. Trends in snacking among U.S. children. *Health Affairs (Project Hope)*. 2010;29:398-404.

4. Cockroft JE, Durkin M, Masding C, Cade JE. Fruit and vegetable intakes in a sample of pre-school children participating in the 'Five for All' project in Bradford. *Public Health Nutr*. 2005;8:861-869.

5. Wang Y, Li J. Tracking of dietary intake patterns is associated with baseline characteristics of urban low-income African-American adolescents. *J Nutr*. 2008;138:94-100.

6. Watt RG, Dykes J, Sheiham A. Socio-economic determinants of selected dietary indicators in British pre-school children. *Public Health Nutr*. 2001;4:1229-1233.

7. Duncker K. Expiremental modification of children's food preferences through social suggestion. *J Abnorm Soc Psychol*. 1938;33:489-507.

8. Cullen KW, Baranowski T, Rittenberry L, Olvera N. Social-environmental influences on children's diets: results from focus groups with African-, Euro- and Mexican-American children and their parents. *Health Educ Res*. 2000;15:581-590.

9. Baranowski T, Cullen KW, Baranowski J. Psychosocial correlates of dietary intake: advancing dietary intervention. *Annu Rev Nutr*. 1999;19:17-40.

10. Byrd-Bredbenner C, Abbot JM, Cussler E. Nutrient profile of household food supplies of families with young children. *J Am Diet Assoc*. 2009;109:2057-2062.

11. Russell CG, Worsley A. Do children's food preferences align with dietary recommendations? *Public Health Nutr*. 2007;10:1223-1233.

12. Brody G, Stoneman Z. Selective imitation of same-age, older, and younger peer models. *Child Dev*. 1981;52:717-720.

13. Baumrind D. Current patterns of parental authority. *Developmental Psychology Monograph, Part 2*. 1971;4:1-103.

14. Obesity prevalence among low-income, preschool-aged children -- United States, 1998-2008. *Morbidity & Mortality Weekly Report*. 2009;58:769-773.

15. O'Connor TM, Hughes SO, Watson KB, Baranowski T, Nicklas TA, Fisher JO, Beltran A, Baranowski JC, Qu H, Shewchuk RM. Parenting practices are associated with fruit and vegetable consumption in pre-school children. *Public Health Nutr*. 2010;13:91-101.

16. Birch L. Development of food acceptance patterns in the first years of life. *Proc Nutr Soc*. 1998;57:617-624.

17. Hughes SO, Power TG, Orlet Fisher J, Mueller S, Nicklas TA. Revisiting a neglected construct: parenting styles in a child-feeding context. *Appetite*. 2005;44:83-92.

18. Arnas YA. The effects of television food advertisement on children's food purchasing requests. *Pediatr Int*. 2006;48:138-145.

19. Proctor MH, Moore LL, Gao D, Cupples LA, Bradlee ML, Hood MY, Ellison RC. Television viewing and change in body fat from preschool to early adolescence: The Framingham Children's Study. *Int J Obes Relat Metab Disord*. 2003;27:827-827.

20. Resnicow K, Davis-Hearn M, Smith M, Baranowski T, Lin LS, Baranowski J, Doyle C, Wang DT. Social-cognitive predictors of fruit and vegetable intake in children. *Health Psychol*. 1997;16:272-276.

21. Lowe CF, Horne PJ, Tapper K, Bowdery M, Egerton C. Effects of a peer modelling and rewards-based intervention to increase fruit and vegetable consumption in children. *Eur J Clin Nutr*. 2004;58:510-522.

22. Birch LL. Effects of peer models' food choices and eating behaviors on preschoolers' food preferences. *Child Dev*. 1980;51:489-496.

23. Sullivan S, Birch L. Pass the sugar, pass the salt: experience dictates preference. *Dev Psychol*. 1990;26:546-555.

24. Birch LL, Fisher JA, eds. *The role of experience in the development of children's eating behavior*. Why We Eat What We Eat: The Psychology of Eating. 1996, American Psychological Association: Washington DC. 113-141.

25. Birch L, Marlin D. I don't like it; I've never tried it: effects of exposure on two-year-old children's food preferences. *Appetite*. 1982;3:353-360.

26. Kroller K, Warschburger P. Associations between maternal feeding style and food intake of children with a higher risk for overweight. *Appetite*. 2008;51:166-172.

27. Kroller K, Warshburger P. Maternal feeding strategies and child's food intake: considering weight and demographic influences using structural equation modeling. *Int J Behav Nutr Phys Act.* 2009;6:78-86.

28. Spruijt-Metz D, Lindquist CH, Birch LL, Fisher JO, Goran MI. Relation between mothers' child-feeding practices and children's adiposity. *Am J Clin Nutr*. 2002;75:581-586.

29. Gable S, Lutz S. Household, parent and child contributions to childhood obesity. *J Home Econ*. 2000;49:293-300.

30. Hoerr SL, Hughes SO, Fisher JO, Nicklas TA, Liu Y, Shewchuk RM. Associations among parental feeding styles and children's food intake in families with limited incomes. *Int J Behav Nutr Phys Act*. 2009;6:55.

31. Hertzler AA. Children's food patterns--a review: Family and group behavior. *J Am Diet Assoc*. 1983;83:555-560.

32. Morris JL, Neustadter A, Zidenburg-Cherr A. First-grade gardeners more likely to taste vegetables. *Cal Ag*. 2001;55:43-46.

33. Aldridge V, Dovey TM, Halford JCG. The role of familiarity in dietary development. *Dev Rev*. 2009;29:32-44.

34. Wardle J, Herrera M, Cooke L, Gibson E. Modifying children's food preferences: the effects of exposure and reward on acceptance of an unfamiliar vegetable. *Eur J Clin Nutr*. 2003;57:341-341.

35. Russell CG, Worsley A. A population-based study of preschoolers' food neophobia and its associations with food preferences. *J Nutr Educ Behav*. 2008;40:11-19.

36. Dovey TM, Staples PA, Gibson EL, Halford JCG. Food neophobia and `picky/fussy' eating in children: A review. *Appetite*. 2006;50:181-193.

37. Hansen-Petrik MB, Tucker AP, Nodell HA. The influence of play fruits and vegetables on fruit and vegetable intake among toddlers. *FASEB J*. 2007;21:671.

38. Lynch M. Playing with food. A novel approach to understanding nutritional behaviour development. *Appetite*. 2010;54:591-594.

39. Lynch M. Familiarizing with toy food: preliminary research and future directions. *J Nutr Educ Behav*. 2011.[Epub ahead of print].

40. Matheson D, Spranger K, Saxe A. Preschool children's perceptions of food and their food experiences. *J Nutr Educ Behav*. 2004;34:85-92.

41. Wardle J, Sanderson S, Leigh Gibson E, Rapoport L. Factor-analytic structure of food preferences in four-year-old children in the UK. *Appetite*. 2001;37:217-223.

42. Boutelle KN, Birkeland RW, Hannan PJ, Story M, Neumark-Sztainer D. Associations between maternal concern for healthful eating and maternal eating behaviors, home food availability, and adolescent eating behaviors. *J Nutr Educ Behav*. 2007;39:248-256.

43. USDA. MyPlate. 2011. Available at: http://www.choosemyplate.gov/. Accessed: July 15, 2011.

44. Rozin P. Preference and affect in food selection. in *Preference, Behavior, and Chemoreception*; Kroeze JHA. London, 1979. p. 289-297.

45. Lineberger SE, Zajicek JM. School gardens: Can a hands on teaching tool affect students' attitudes and behaviors regarding fruit and vegetables? *Hort Technology*. 2000;10:593-597.

46. Johnson SL, Bellows L, Beckstrom L, Anderson J. Evaluation of a social marketing campaign targeting preschool children. *Am J Health Behav*. 2007;31:44-55.

47. Wardle J, Cooke LJ, Gibson EL, Sapochnik M, Sheiham A, Lawson M. Increasing children's acceptance of vegetables; a randomized trial of parent-led exposure. *Appetite*. 2003;40:155-162.

48. Birch LL, McPhee L, Shoba BC, Pirok E, Steinberg L. What kind of exposure reduces children's food neophobia? Looking vs tasting. *Appetite*. 1987;9:171-178.

49. Birch LL, Gunder L, Grimm-Thomas K, Laing D. Infant's consumption of a new food enhances acceptance of similar foods. *Appetite*. 1998;30:283-295.

50. Reverdy C, Chesnel F, Schlich P, Koster EP, Lange C. Effect of sensory education on willingness to taste novel food in children. *Appetite*. 2008;51:156-165.

51. Fisher JO, Birch LL. Parents' restrictive feeding practices are associated with young girls' negative self-evaluation of eating. *J Am Diet Assoc*. 2000;100:1341-1346.

52. Fisher J, Birch L. Restricting access to palatable foods affects children's behavioral response, food selection, and intake. *Am J Clin Nutr*. 1999;69:1264-1272.

CONCLUSION

Overall, this research provides significant preliminary information about play food related to a multitude of variables including gender, age, food preference, food neophobia, and feeding behaviors, as reported by mothers of children ages 2-5. Moreover, this body of research contributes to the limited available literature in this area which agrees that pretend play can be a useful mechanism of exposure to new foods, as well as proxy for interactive education to help children learn about healthy nutrition behaviors literature. This study suggests that there may be some meaningful relationships between play food and nutrition parameters. Future research should experimentally explore these relationships, specifically between play food exposure and food preferences in preschool-aged children.

APPENDIX

EXPANDED METHODOLOGY

Play-food Research Team Script

Hello! My name is _____ (first name). I am from the University of Tennessee and we are conducting a survey about pretend play and preschoolers. The survey should take less than 30 minutes to complete and you will get a $10 (store name) gift card after completing the survey.

<table>
<tr><td colspan="2">1.) Would you be interested in filling out our survey today while you wait?</td></tr>
<tr><td>If "YES"

2.) Are you the mother of a child between the ages of 2-5 years old, who is not yet in Kindergarten?</td><td>If "NO"

Thank you for your time</td></tr>
<tr><td>If "YES"

3.) Does the child live with you at least 4 days per week?</td><td>If "NO"

I'm sorry. You're not eligible to complete the survey. Thank you for your time!</td></tr>
<tr><td>If "YES"

Congratulations! You are eligible to participate in the survey!</td><td>If "NO"

I'm sorry. You're not eligible to participate in the survey. Thank you for your time!</td></tr>
<tr><td colspan="2">Here is an information sheet for the survey. Read it over, and decide if you would like to complete the survey. You may keep this sheet for your reference. When you are done reading it, and if you are interested in participating, alert me, and I will give you the survey to complete.</td></tr>
<tr><td>If they are interested:

OK, great! (Question 4)</td><td>If they are not interested:

OK, thank you for your time.</td></tr>
<tr><td colspan="2">4.) Do you have more than one child between the ages of 2 and 5?</td></tr>
<tr><td>If "YES"

Please complete this survey based on your older child. Is your older child a boy or a girl?</td><td>If "NO"

Is your child a boy or a girl?</td></tr>
</table>

Instructions:

Provide clipboard with survey (coded for gender) and pen to participant.

"Here is the survey. Completion of the survey constitutes your consent to participate in the study. The survey should take less than 30 minutes to complete. Upon completion you will be asked to sign a sheet with your name and zip code indicated you have received your $10 (store name) gift card. We will stamp your hand with washable ink to help us keep track of who

has already participated. When you have completed the survey, please alert me or one of the other people in an orange t-shirt. Do you have any questions?"

When participant is done:

Do you have any questions? (Look through survey to ensure they have completed major parts). Thank you so much for your participation! (Obtain signature and zip code on separate sheet and provide store gift card)

Invitation to Participate in a Research Study

Pretend Play Survey

Dear potential participant,

Researchers at the University of Tennessee Knoxville are interested in learning about how mothers choose pretend play kitchen items for young children. The Pretend Play Survey includes questions about your child and family, how you choose pretend play items, the pretend play items you have at home, and your child's eating behaviors and preferences. The survey should take approximately 20-30 minutes to complete.

There are no known risks if you decide to participate in this research study, nor are there any costs for participating. The information you provide will help us understand the pretend play environment in the home of preschool-aged children. The information collected may not benefit you directly, but what we learn from this study will provide valuable information that has potential to benefit parents and children in the future.

The survey is anonymous. Do not write your name on the survey. No one will be able to identify you or your answers. Should the results of this survey be published, no individual information will be disclosed. Upon completion of the survey, you will receive a $10 store gift card, and be asked to sign your name and zip code on a *separate sheet* verifying that you have received the gift card.

Participation in this research study is strictly voluntary and you may refuse to answer any questions at any time with no penalty. Your completion of the survey constitutes your consent to participate in this study.

If you have any questions at any time about the survey you may contact the researcher Melissa Hansen-Petrik, The University of Tennessee, 1215 West Cumberland Ave. Room 229, Knoxville, TN 37996-1920, and 865-974-6264. If you have questions about your rights as a participant, contact the Office of Research Compliance Officer at 865-974-7697. This study was approved by the IRB on March 31st, 2011.

Thank you for your interest in this project!

Sincerely,

Jenna Waters
The University of Tennessee

Melissa Hansen-Petrik
The University of Tennessee

Pretend Play Survey

Your completion of this survey indicates that you have received the information sheet, and constitutes your consent to participate in this study.

Please answer the following questions about your 2-5 year old child:

1. What is your child's gender?

   ☐ Male
   ☐ Female

2. What is your child's month of birth?

   ☐ January
   ☐ February
   ☐ March
   ☐ April
   ☐ May
   ☐ June
   ☐ July
   ☐ August
   ☐ September
   ☐ October
   ☐ November
   ☐ December

3. What is your child's year of birth?

   ☐ 2005
   ☐ 2006
   ☐ 2007
   ☐ 2008
   ☐ 2009

4. What is your child's ethnic background (may select more than one)?

   ☐ White, non-Hispanic
   ☐ Black, non-Hispanic
   ☐ Hispanic
   ☐ Asian, Indian, or Pacific islander
   ☐ American Indian, Alaskan Native, or Hawaiian Native
   ☐ Other, please list: _____

5. What is your child's height? _____ inches (month/year measured:_____)

   ☐ Don't know

6. What is your child's weight? _____ pounds (month/year measured:_____)

   ☐ Don't know

7. Which of the following age ranges best describes *your* **age**?

   ☐ <20 years
   ☐ 20-24 years
   ☐ 25-29 years
   ☐ 30-39 years
   ☐ 40-49 years
   ☐ 50-59 years
   ☐ 60+ years

8. What is the highest level of education you have attained?

   ☐ Some high school
   ☐ High school diploma or GED
   ☐ Two-year degree, trade school or equivalent
   ☐ Some 4-year college
   ☐ Bachelor's degree
   ☐ Graduate or professional degree (i.e. Masters, PhD, JD, MD, etc.)
   ☐ Other, please list: _____

9. What is your current marital status?

- ☐ Married
- ☐ Widowed
- ☐ Divorced
- ☐ Separated
- ☐ Never married

10. If there is another parent in the home, what is their highest level of education attained?

- ☐ Not Applicable
- ☐ Some high school
- ☐ High school diploma or GED
- ☐ Two-year degree, trade school or equivalent
- ☐ Some 4-year college
- ☐ Bachelor's degree
- ☐ Graduate or professional degree (i.e. Masters, PhD, JD, MD, etc.)
- ☐ Other, please list: _____

11. What is your average gross annual household income?

- ☐ Under $10,000
- ☐ $10,001-$20,000
- ☐ $20,001-$30,000
- ☐ $30,001-$40,000
- ☐ $40,000-$50,000
- ☐ $50,001-$75,000
- ☐ $75,001-$100,000
- ☐ Over $100,000

12. What is your current employment status?

- ☐ Home duties, full time
- ☐ Unemployed
- ☐ Student
- ☐ Retired
- ☐ Employed, part time
- ☐ Employed, full time
- ☐ Other

13. Does this child regularly participate in childcare or preschool outside your home? If not, please skip to question **17**.

- ☐ Yes
- ☐ No

14. How many hours per week does the child attend childcare?

- ☐ Less than 5 hours per week
- ☐ 5-10 hours/week
- ☐ 11-20 hours/week
- ☐ 21-30 hours/week
- ☐ 31-40 hours/week
- ☐ More than 40 hours/week

15. Which of the following best describes the child's childcare setting?

- ☐ In home childcare
- ☐ Child care center
- ☐ Parents/Mother Day out program
- ☐ Headstart Preschool
- ☐ Pre-kindergarten program through the local school system
- ☐ Private preschool
- ☐ Other, please list:_____

16. How many meals and snacks does the child consume at childcare per week?

- ☐ None
- ☐ 1
- ☐ 2-3
- ☐ 4-5
- ☐ 6-7
- ☐ 8-9
- ☐ 10 or more

17. Please list the AGE (in years) of any other children living in the household on the appropriate gender line (M=male, F=female). Do **NOT** include the child for whom you're completing the survey:

Child 1: _____ M _____F

Child 2: _____ M _____F

Child 3: _____ M _____F

Child 4: _____ M _____F

Child 5: _____ M _____F

Child 6: _____ M _____F

Please answer the following questions about play foods (plastic or other toy foods for pretend play):

18. Where would you be most likely to purchase play foods? Check all that apply.

- ☐ Amazon.com
- ☐ Consignment sale/yard sale
- ☐ Ebay
- ☐ Marshall's or TJ Maxx
- ☐ Online specialty toy retailer (e.g. IQKids.com, outofthetoybox.com)
- ☐ Sam's Club or Costco
- ☐ Specialty toy retailer (e.g. Smart Toys and Books)
- ☐ Target
- ☐ Toys 'R Us
- ☐ Walmart
- ☐ Other, please list: _____
- ☐ I would not purchase play foods (skip to question 20)

19. In choosing play foods for your child, how important are the following factors?

1 = not important at all, 2 = unimportant, 3 = neutral, 4 = important, 5 = very important.

Fun	1	2	3	4	5
Interactive	1	2	3	4	5
Food my child likes	1	2	3	4	5
Food I like	1	2	3	4	5
Price	1	2	3	4	5
Healthfulness	1	2	3	4	5
Educational value	1	2	3	4	5
Exposure to foods of other cultures	1	2	3	4	5
Bright colors and appealing textures	1	2	3	4	5
Large variety of foods in the set	1	2	3	4	5
Brand name	1	2	3	4	5
Religious preference	1	2	3	4	5
Other: _____	1	2	3	4	5

20. Which of the following branded play food products do you own, if any (check all that apply)?

- ☐ McDonald's Backpack Play Food Set
- ☐ McDonald's Cash Register
- ☐ Deluxe Dairy Queen Play Set
- ☐ Pizza Hut Deluxe Play Delivery Set
- ☐ Just Like Home - Subway Deluxe Play Food Set
- ☐ I do not own any branded play food sets
- ☐ Other branded products, please identify: _____

_____

_____

21. Which of the following play food & food-related toys do you have in the home (check all that apply)?

- ☐ Play food
- ☐ Kitchen
- ☐ Toaster
- ☐ Cash register
- ☐ Microwave oven
- ☐ Shopping cart/ basket
- ☐ Pots and pans
- ☐ Blender and/or mixer
- ☐ Other, please list: _____
- ☐ I do not have play food or food related toys in the home

22. How often does your child help you or other family members in preparation of meals or snacks?

- ☐ 6-7 days per week
- ☐ 3-5 days per week
- ☐ 1-2 days per week
- ☐ 1-3 times per month
- ☐ Less than once per month

23. How often does your child eat in a fast food setting (i.e. McDonalds, Burger King, Wendy's)?

- ☐ None
- ☐ 1
- ☐ 2-3
- ☐ 4-5
- ☐ 6-7
- ☐ 8-9
- ☐ 10 or more

In this section, please report on your child's food likes and dislikes (by circling the appropriate number) as they have been typically over the past few months- that is, not when you child was sick, or something particularly unusual was happening in his or her life. If your child has one or more play food versions of the food, please put a checkmark in the third column.

***1 = dislikes extremely, 2 = dislikes a little, 3 = neither likes nor dislikes, 4 = likes a little, 5 = likes extremely, N/A = never tried it**

Food Item	**Please circle a number***	**Has this play food at home** 
Apples	1 2 3 4 5 N/A	
Apricots	1 2 3 4 5 N/A	
Artichokes	1 2 3 4 5 N/A	
Asparagus	1 2 3 4 5 N/A	
Avocados	1 2 3 4 5 N/A	
Bacon	1 2 3 4 5 N/A	
Bagels	1 2 3 4 5 N/A	
Bananas	1 2 3 4 5 N/A	
Baked beans	1 2 3 4 5 N/A	
Beets	1 2 3 4 5 N/A	
Bell peppers	1 2 3 4 5 N/A	
Berries, other than strawberries	1 2 3 4 5 N/A	
Biscuits	1 2 3 4 5 N/A	
Bologna	1 2 3 4 5 N/A	
Bread, white	1 2 3 4 5 N/A	
Bread, whole grain	1 2 3 4 5 N/A	
Broccoli	1 2 3 4 5 N/A	

Food Item	Please circle a number*						Has this play food at home ✓
1 = dislikes extremely, 2 = dislikes a little, 3 = neither likes nor dislikes, 4 = likes a little, 5 = likes extremely, N/A = never tried it							
Brussels sprouts	1	2	3	4	5	N/A	
Burger	1	2	3	4	5	N/A	
Burrito	1	2	3	4	5	N/A	
Butter	1	2	3	4	5	N/A	
Cabbage	1	2	3	4	5	N/A	
Cake or cupcakes	1	2	3	4	5	N/A	
Candy, non-chocolate	1	2	3	4	5	N/A	
Carrots	1	2	3	4	5	N/A	
Cauliflower	1	2	3	4	5	N/A	
Celery	1	2	3	4	5	N/A	
Cereal, sweetened (Lucky Charms, Honeycomb, etc.)	1	2	3	4	5	N/A	
Cereal, unsweetened (Cheerios, Rice Krispies, Chex, etc.)	1	2	3	4	5	N/A	
Cheese	1	2	3	4	5	N/A	
Cherries	1	2	3	4	5	N/A	
Chicken baked, grilled, or other non-breaded kind	1	2	3	4	5	N/A	
Chicken nuggets, fingers, or fried	1	2	3	4	5	N/A	
Chocolate candy	1	2	3	4	5	N/A	
Coffee	1	2	3	4	5	N/A	

Food Item	Please circle a number*						Has this play food at home ✓
1 = dislikes extremely, 2 = dislikes a little, 3 = neither likes nor dislikes, 4 = likes a little, 5 = likes extremely, N/A = never tried it							
Cooked greens (i.e. spinach, collards)	1	2	3	4	5	N/A	
Cookies	1	2	3	4	5	N/A	
Corn	1	2	3	4	5	N/A	
Cornbread	1	2	3	4	5	N/A	
Cottage cheese	1	2	3	4	5	N/A	
Crackers	1	2	3	4	5	N/A	
Croissant	1	2	3	4	5	N/A	
Cucumber	1	2	3	4	5	N/A	
Eggplant	1	2	3	4	5	N/A	
Egg roll	1	2	3	4	5	N/A	
Donuts, Danishes, other pastries	1	2	3	4	5	N/A	
Eggs	1	2	3	4	5	N/A	
Fish sticks or other fried fish	1	2	3	4	5	N/A	
Fish, not fried (i.e. tuna, salmon, etc.)	1	2	3	4	5	N/A	
French fries	1	2	3	4	5	N/A	
Fruit-flavored beverages (e.g. Hi-C, Koolaid)	1	2	3	4	5	N/A	
Fruit juice (100%)	1	2	3	4	5	N/A	
Gelatin dessert	1	2	3	4	5	N/A	

Food Item	Please circle a number*						Has this play food at home ✓
1 = dislikes extremely, 2 = dislikes a little, 3 = neither likes nor dislikes, 4 = likes a little, 5 = likes extremely, N/A = never tried it							
Grapes	1	2	3	4	5	N/A	
Green beans	1	2	3	4	5	N/A	
Grits	1	2	3	4	5	N/A	
Ham	1	2	3	4	5	N/A	
Honey	1	2	3	4	5	N/A	
Hot dogs	1	2	3	4	5	N/A	
Hot sauce	1	2	3	4	5	N/A	
Ice cream or frozen yogurt	1	2	3	4	5	N/A	
Ketchup	1	2	3	4	5	N/A	
Kiwi	1	2	3	4	5	N/A	
Jelly	1	2	3	4	5	N/A	
Legumes (i.e. black beans, lentils, pinto beans, etc.)	1	2	3	4	5	N/A	
Lettuce	1	2	3	4	5	N/A	
Macaroni and cheese	1	2	3	4	5	N/A	
Mango	1	2	3	4	5	N/A	
Mayonnaise	1	2	3	4	5	N/A	
Melons	1	2	3	4	5	N/A	
Milk, Chocolate	1	2	3	4	5	N/A	
Milk, White	1	2	3	4	5	N/A	
Milkshakes	1	2	3	4	5	N/A	
Muffin	1	2	3	4	5	N/A	

Food Item	Please circle a number*						Has this play food at home ✓
1 = dislikes extremely, 2 = dislikes a little, 3 = neither likes nor dislikes, 4 = likes a little, 5 = likes extremely, N/A = never tried it							
Mushrooms	1	2	3	4	5	N/A	
Mustard	1	2	3	4	5	N/A	
Nuts	1	2	3	4	5	N/A	
Oatmeal	1	2	3	4	5	N/A	
Olives	1	2	3	4	5	N/A	
Okra	1	2	3	4	5	N/A	
Onion	1	2	3	4	5	N/A	
Oranges	1	2	3	4	5	N/A	
Pancake	1	2	3	4	5	N/A	
Papaya	1	2	3	4	5	N/A	
Pasta/noodles	1	2	3	4	5	N/A	
Peaches	1	2	3	4	5	N/A	
Peanut butter	1	2	3	4	5	N/A	
Peas	1	2	3	4	5	N/A	
Pears	1	2	3	4	5	N/A	
Pepperoni	1	2	3	4	5	N/A	
Pickles	1	2	3	4	5	N/A	
Pie	1	2	3	4	5	N/A	
Pineapple	1	2	3	4	5	N/A	
Pizza	1	2	3	4	5	N/A	
Plums	1	2	3	4	5	N/A	

Food Item	Please circle a number*						Has this play food at home ✓
1 = dislikes extremely, 2 = dislikes a little, 3 = neither likes nor dislikes, 4 = likes a little, 5 = likes extremely, N/A = never tried it							
Popcorn	1	2	3	4	5	N/A	
Popsicles	1	2	3	4	5	N/A	
Pork chop	1	2	3	4	5	N/A	
Potatoes	1	2	3	4	5	N/A	
Pretzels	1	2	3	4	5	N/A	
Pudding	1	2	3	4	5	N/A	
Quiche	1	2	3	4	5	N/A	
Raisins	1	2	3	4	5	N/A	
Refried beans	1	2	3	4	5	N/A	
Rice, brown	1	2	3	4	5	N/A	
Rice, white	1	2	3	4	5	N/A	
Salad dressing	1	2	3	4	5	N/A	
Salami	1	2	3	4	5	N/A	
Salsa	1	2	3	4	5	N/A	
Sausage	1	2	3	4	5	N/A	
Shrimp	1	2	3	4	5	N/A	
Snack chips (potato, tortilla)	1	2	3	4	5	N/A	
Soda	1	2	3	4	5	N/A	
Soup	1	2	3	4	5	N/A	
Sour cream	1	2	3	4	5	N/A	
Squash (yellow)	1	2	3	4	5	N/A	

Food Item	Please circle a number*						Has this play food at home ✓
1 = dislikes extremely, 2 = dislikes a little, 3 = neither likes nor dislikes, 4 = likes a little, 5 = likes extremely, N/A = never tried it							
Strawberries	1	2	3	4	5	N/A	
Steak	1	2	3	4	5	N/A	
Sushi	1	2	3	4	5	N/A	
Sweet potatoes	1	2	3	4	5	N/A	
Syrup	1	2	3	4	5	N/A	
Taco	1	2	3	4	5	N/A	
Tangerines	1	2	3	4	5	N/A	
Tea	1	2	3	4	5	N/A	
Tofu	1	2	3	4	5	N/A	
Tomatoes	1	2	3	4	5	N/A	
Tortillas	1	2	3	4	5	N/A	
Turkey	1	2	3	4	5	N/A	
Veggie burgers	1	2	3	4	5	N/A	
Waffles	1	2	3	4	5	N/A	
Whipped Topping	1	2	3	4	5	N/A	
Yogurt	1	2	3	4	5	N/A	
Zucchini	1	2	3	4	5	N/A	

Please indicate how well you either agree or disagree to the following statements about your child by circling the corresponding number.

*** 1 = totally disagree, 2 = moderately disagree, 3 = disagree, 4 = neither agree or disagree, 5 = agree, 6 = moderately agree, 7 = totally agree.**

Statement	**Please circle a number ***
My child is constantly sampling new and different foods.	1 2 3 4 5 6 7
My child does not trust new foods.	1 2 3 4 5 6 7
If my child doesn't know what is in a food, she won't try it.	1 2 3 4 5 6 7
My child likes foods from different cultures.	1 2 3 4 5 6 7
For my child, food from cultures different to her own looks too weird for her to eat.	1 2 3 4 5 6 7
At social gatherings, my child will try a new food.	1 2 3 4 5 6 7
My child is afraid to eat things she has never had before.	1 2 3 4 5 6 7
My child is very particular about the foods she will eat.	1 2 3 4 5 6 7
My child will eat almost anything.	1 2 3 4 5 6 7
My child likes going places serving foods from cultures different to her own.	1 2 3 4 5 6 7

How often during a meal do YOU:

		Never	Rarely	Sometimes	Most of the time	Always
1.	Physically struggle with the child to get him or her to eat (for example, physically putting the child in the chair so he or she will eat).	1	2	3	4	5
2.	Promise the child something other than food if he or she eats (for example, "If you eat your beans, we can play ball after dinner").	1	2	3	4	5
3.	Encourage the child to eat by arranging the food to make it more interesting (for example, making smiley faces on pancakes).	1	2	3	4	5
4.	Ask the child questions about the food during dinner.	1	2	3	4	5
5.	Tell the child to eat at least a little bit of food on his or her plate.	1	2	3	4	5
6.	Reason with the child to get him or her to eat (for example, "Milk is good for your health because it will make you strong").	1	2	3	4	5
7.	Say something to show your disapproval of the child for not eating dinner.	1	2	3	4	5
8.	Allow the child to choose the foods he or she wants to eat for dinner from foods already prepared.	1	2	3	4	5
9.	Compliment the child for eating food (for example, "What a good boy! You're eating your beans").	1	2	3	4	5
10.	Suggest to the child that he or she eats dinner, for example by saying, "Your dinner is getting cold".	1	2	3	4	5
11.	Say to the child "Hurry up and eat your food".	1	2	3	4	5
12.	Warn the child that you will take away something **other than food** if he or she doesn't eat (for example, "If you don't finish your meat, there will be no play time after dinner").	1	2	3	4	5

13.	Tell the child to eat something on the plate (for example, “eat your beans”).	1	2	3	4	5
14.	Warn the child that you will take a food away if the child doesn’t eat (for example, “If you don’t finish your vegetables, you won’t get fruit”).	1	2	3	4	5
15.	Say something positive about the food the child is eating during dinner.	1	2	3	4	5
16.	Spoon-feed the child to get him or her to eat dinner.	1	2	3	4	5
17.	Help the child to eat dinner (for example, cutting the food into smaller pieces).	1	2	3	4	5
18.	Encourage the child to eat something by using food as a reward (for example, “If you finish your vegetables, you will get some fruit”).	1	2	3	4	5
19.	Beg the child to eat dinner.	1	2	3	4	5

Please circle the number that represents how you feel about the following:

	Not at all	**A little bit**	**Somewhat**	**Very much**
How much do you personally care about eating healthful food?	1	2	3	4

Thank you for completing this survey!

VITA

Jenna Waters was born in Binghamton, New York, on July 17, 1987. She was raised in Vestal, New York, and attended Tioga Hills Elementary School and Vestal Middle School. She graduated from Vestal High School in 2005. From there, she went to Syracuse University, and transferred her sophomore year to The University of Tennessee, Knoxville, where she received her Bachelor of Science in Human Ecology in 2009. She completed her dietetic internship through the University of Northern Colorado Distance Internship Program, and became a Registered Dietitian in June 2011.

Jenna now works as the Sports Nutrition Assistant for The University of Tennessee Athletic Department. She is currently pursuing a Master's of Science in Nutrition at The University of Tennessee, Knoxville.